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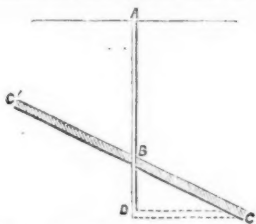
### Royal School of Mines.

#### PROF. SMYTH'S LECTURES ON MINING—No. XXXVIII.

[BY OUR SPECIAL REPORTER.]

It is under the favourable circumstances of almost horizontal condition that the very extensive workings in the northern counties are carried out, from which, so far, our examples have chiefly been drawn. It is there that we can most advantageously study this system of working on a large scale, where the workings are carried out in every direction from the shaft. In this respect they differ much from the workings in other districts, where the levels pass both ways, and the workings extend to the rise, leaving the lower portion to be worked in another lift, by means of pits put down deeper, or by means of an inclined plane. It is a very usual thing to seek for a central place where to put down the most important plant, but it will depend upon the demand for the mineral, and on other circumstances, as to whether the whole of the mineral is to be got alone or in successive lifts or slices.

In Fig. 32 the portion to the rise, B C, will be worked by means



of the shaft, A B; but then will come the question how the portion below B is to be got. Under some circumstances it may be advisable to sink other shafts, while in some cases this cannot be done, as, for instance, when this portion is under the sea. Another method is to put down an inclined plane, or pair of inclined planes, for the shaft, A B, and so work that portion to the dip: while a still further plan is open, which has not unfrequently been adopted—to sink the main shaft lower, as to D, and then to put out a stone drift to intercept the coal at some point, C, and from this point to work to the rise again. In this latter method the mineral as it is obtained may be dropped by intermediate shafts to the lower level. This will be a means of extra cost, whether working by the pillar or long wall system. The regularity of the workings may not only be affected by intervening faults, or undulations of the measures, but also to a certain extent in portions by the lie, or position, of the cleat of the coals, as referred to a line of levels. It is desirable that the bords should be carried as far as possible before they are holed through from one to another; ultimately, however, they will have to be holed through, leaving pillars usually about 30 yards long. They are holed through, partly for the sake of the ventilation, partly because in fiery coals it would not otherwise be possible to secure safety, and partly for the cheapness of getting to the coal. If the cleat run parallel to our principal levels—to the extension of the field—the workings assume great regularity, for the bords can be set off from these levels at once; if the cleat run at right angles to the levels, then other "running" levels will have to be driven in the direction of the cleat and bords set off from them, and similarly if the cleat runs in an oblique direction. If you have a large tract of ground it is advisable to explore it by means of pairs of these headways in different directions, and then when it comes to actual working the bords may be set off for these according to the direction of the cleavage planes. It is important to bear in mind that when you begin pillar working you introduce the most critical portion of the whole operations, where the most precautions are needed; and you establish that part of the ground to which the name of "goaf" is given, and which has been the source of so many great accidents in the northern collieries. According to the position of the strata, &c., this is likely to be a magazine of gas and of fire-damp, the ground being broken to an unknown height, and the fire-damp being specifically light is apt to pass into these places, and be unaffected by the general ventilation of the mine. This question of the goaf is one which affects the security of the colliery in many ways. Thus, if there be workable seams above you, there must be a limit within which these seams will be very seriously injured, perhaps so as to be rendered quite valueless. Again, if there be areas subject to the presence of water to any great extent—that is to say, permeable strata—unless the workings are so arranged as not to break away this ground into the goaves there is a very serious risk; and after spending large sums in expensive tubing, this may be the means of letting in the water which it has taken such pains to exclude. In shallow ground the formation of this goaf extends to the surface, but in the deeper mines there is satisfactory evidence that the ground which breaks away from the roof occupies a space so much larger that, unless new conditions have packed it more closely, you may take away the pillars over many acres, and yet the ground hold itself together so as not to show at the surface. Workings have been, and are now, opened where the pillars have been taken away under a tidal river, or even under the sea. There is another fact which needs to be constantly borne in mind; if you have your colliery extend over a large area there is a great temptation to begin some of this pillar working near the shaft bottom, but it is obvious that with the open lights which are generally carried in the main roads, and with the ventilating furnace at the bottom of the shaft, there must be a very great risk in having in such close proximity these goaves, subject to containing in

them large quantities of fire-damp. Of course, the goaves must be kept under strict supervision, the ventilation must be carefully regulated, and strict precautions taken that no one goes near them with open lights. Where there are large areas to deal with this cannot be avoided to a great extent; all you can do then is to leave these masses of coal as barriers, and to cause the ventilation to set in such direction that after having once passed by these goaves it should not again come in contact with naked lights.

A few modifications of this pillar and bord system may be found in Lancashire and North Staffordshire; and in these districts we shall generally find that the roof is not so good as in the North of England, and the angle of inclination is apt to be more considerable. These cannot be seen more than in the coal field of the Potteries, which contains the greatest thickness of coal in England, and which until lately has not had justice done to it. Where the seams dip at a considerable angle, it has usually been the case to sink vertical shafts, and then to intersect the seam by means of cross-cuts: each one of these cross-cuts on reaching the seam has levels or drifts opened for it, a lower one for drainage and haulage, and an upper one for an airway. This pair of levels has generally a pillar of 10 to 15 yards between, holed through at intervals during the working, but afterwards stopped up. Owing to the great inclination of the seam it would be difficult to work these bords upwards, and it is usual, therefore, that dips, or inclined planes, are driven from one pair of these main levels to another (a distance of 60 to 120 yards). The tract of coal included between these "jig-brows" is then subdivided into pillars, of much the same length but narrower than those of the North Country, inasmuch as they have not to stand so long. When the coal has thus been broken up to the boundary, or the old working, the getting of the pillars is commenced in diagonal lines. The pillars are cut in slices, and the men are protected, as before, by abundant props and by walling. Another plan is to build up strong pieces of wood, 3 ft. or 3 ft. 6 in., in pairs, placed transversely and alternately; this gives a good bearing on the roof, and has been often used of late both in the long wall and pillar systems. By this means the greater proportion of the coal is obtained, though special difficulties in parts cause some of it to be abandoned.

In the North Wales mines a curious modification of the pillar system has been carried out. There is in some places a magnificent roof, and the workings are carried forwards 5 yards wide, and intersected by others of the same width, leaving a pillar between only 4 yards wide, and sometimes it has even been attempted to get some of the pillar. A curious contrast to this may be seen in the Isle of Anglesea, where in the trough of coal which runs through the island the coal is tender and the roof bad; the drifts are only 4 ft. wide, and the pillars between 6 yards. There is another plan, which may be considered as intermediate between the methods we have been considering and the long wall system. The methods already referred to are applicable to seams of 3 to 8 ft. thick, or, as an extreme case at Whitehaven, 10 or 11 ft.; for thicker seams, which are, however, rare, special methods must be employed. The Barnsley seam is a bed of coal which may be traced into Derbyshire, under the name of the Top Hard: it becomes thicker as it approaches the town of Sheffield, being about 4 or 5 ft. in its southern parts, and 7 to 9 ft. further north. The following is the plan which till a few years ago was very frequent in Yorkshire. Levels are driven out from the pit, and drifts set up the rise of the coal, pillars being left to protect the roadway. These main roads of rise working are about 90 yards asunder, and are known as bord-gates. The workings will then consist of a number of parallel bords, set across the cleat of the coal, or about 8 yards in breadth; the pillars between are 3 yards thick, just sufficient of the roof is elastic to prevent it breaking down suddenly. Such work can only be used where the roof is of a strong character, and must be pushed forward quickly, so that the men are every day under "green ground." The lecturer could not help thinking there must have been a great deal of risk unless much timber was employed, and also, since this is a vast system of narrow workings, there must be a great deal of shearing and much small coal, and that may be very disadvantageous in a district where small coal is apt to take fire in the pits. The occurrence of partial goaves, crush, &c., caused this plan almost to disappear, but there have been several modifications, among which is one where they work backwards, leaving the goaf at the outside, and this is a close approximation to one system of long wall. The greater part of the workings carried out in the district during the last 30 years has been on a system similar to that shown in the plan of Lund Hill Colliery. Pairs of bord-gates are driven about 80 yds. apart, and then bords are opened out assuming a distance of about 30 yds. apart. This gives you an advantage, for since you can cut the coal at a greater breadth than in narrow bords, you can get it more economically, and more men can be placed together. There is the disadvantage that in opening out these large portions you begin to get falls of roof, and then as you work back you have a goaf in the middle, and packing has to be built up to enable the men to go on with their work. The number of men which can be put in is very considerable, and it reminds one in that respect of the pillar system, where you can put in a great number of men in a small piece. A not very dissimilar plan is adopted in Derbyshire and North Wales, where the ground is divided into stalls, or wickets, opened to a distance of 13 or 14 ft. In these cases, therefore, the thickness of the rib and the size of opening vary considerably; but all have the great disadvantage that a whole series of goaves are introduced into the workings, which cannot help but be in close proximity to the intake current at numerous points.

The question is very important how far this system of separate workings can be satisfactorily ventilated, and we shall see that it has been a great advantage where the zig-zag arrangement of the workings, partially exploratory, partly actual getting, could be obviated, and the whole thrown into one great extension, along which the ventilating current could be caused to take a simple course. Safety, security, and economy have each to be regarded,

and the question as to the best method of working a given seam is one which will exercise to a great extent the experience and judgment of the manager.

### THE FRUE VANNING MACHINE.

NOTES ON SOME RESULTS OF THE LATE TRIAL OF THE MACHINE AT THE WEST SETON MINE, CORNWALL.

The following assays will give some idea of the separation effected when working on different qualities of material from the tin-floors; but, for the benefit of those who may not be personally acquainted with the ore worked at West Wheal Seton, a few words as to its nature are necessary to a just estimation of the figures submitted. West Wheal Seton Mine is not worked merely for tin; it much exceeds the returns from the former metal. In addition to the tin and copper, and associated more especially with the tin, veinstone. No sharp separation occurs in the lode between the positions of copper ore and those of tin, but the one kind merges into the other, thus making much of an intermediate quality, which may be worked for the one metal as for the other, or for both. The present system of dressing not admitting of both being saved from the same rock. The arsenical mudic always occurs, in greater or less quantity, with the tin, and, as just explained, the copper pyrites is mixed with much of the ore. It will be evident to any practical dresser from these facts that the raw tin, or "witts," as cleaned from the rock will be impure or "foul"—i.e., that in saving the tin most of the arsenical mudic will remain with it, and a varying proportion of the lighter copper ore, according as the separation effected is more or less perfect. From the figures given below it will be noticed that the witts do not, with one exception, exceed in value 2 cwt. of black tin to the ton; the average yield from the biddles of the dressing-floors being about 1½ cwt. With these explanations it will be understood that though the "headings" produced by the machine do not show a very high yield in tin they were as clean as it is possible to make the ore by dressing, previous to a destruction of the accompanying mudic by roasting.

I.—Slimes, very fine, taken from the slime-pits, treated at the rate of 3½ tons in 24 hours.

#### ASSAYS.

Feed, equal to . . . . . 22 lbs. black tin to the ton.

Witts, . . . . . 190 lbs.

Tailings, tin too small to weigh, estimated at 3 lbs. to the ton.

Remarks.—Two samples of the witts produced showed on analysis respectively 24 and 25 per cent. of arsenic, and 2.4 and 2.5 per cent. of copper.

II.—Slimes taken from the head of a slime-buddle after once biddling from slime-pits.

ASSAYS.—Feed, equal to . . . . . 56 lbs. of black tin to the ton.

Witts, . . . . . 201 lbs.

(1)—Tailings, . . . . . 54 lbs.

(2)— . . . . . 44 lbs.

Remarks.—This was a short experiment and an unsatisfactory one, from the great irregularity of the speed of the engine used for driving, which caused great variability in the value of the tailings thrown off.

III.—Mixture of slimes from the slime-pits and of rough sand caught just below the strips. Treated at the rate of 6½ tons in 24 hours.

ASSAYS.—Feed, equal to . . . . . 31 lbs. to the ton.

Witts, or headings, equal to . . . . . 291 lbs.

(1)—Tailings, equal to . . . . . 31 lbs.

(2)— . . . . . worthless.

IV.—A mixture of rough sand and fine slimes, selected as representing the material flowing direct from the stamps. This mixture was made up by taking portions of the heads, middles, and tails of the strips just under the stamps, and mixing with about half its weight of fine slimes from the slime-pits. The material was treated at the rate of 6 tons (dry) in 24 hours, and this rate of treating was limited by the arrangements for feeding by hand, not by the capacity of the machine, which would be equal to 8 tons in the same time if taken direct from the stamps.

ASSAYS.—Feed, equal to . . . . . 39 lbs. to the ton.

Witts . . . . . 224 lbs.

Tailings . . . . . 31 lbs.

V.—Roasted witts, taken direct from the roasting-ovens, and treated at the rate of 6½ tons in 24 hours.

ASSAYS.—Feed, equal to . . . . . 2c. 1 q. 0 lb. black tin to the ton.

Headings, . . . . . 16c. 2 q. 0 lb.

Tailings, . . . . . 0c. 0 q. 3 lb.

Remarks.—The tailings from the present tin-yard, after passing through the hands of 15 dressers, and after being buddled and rebuddled many times, show on assay 11 lbs. black tin to the ton without pulverising. Some of these burnt leavings fed over the machine gave a steady, though of course slight, head of clean tin.

In these various experiments it will be understood that all the results given are from one operation only; the material is fed on to the belt, and as it leaves the machine samples are taken for "tailings," while the mineral delivering at the same time over the head is sampled as "witts." In all cases a very good separation has been effected, although in the second experiment the tailings show more tin than they would under regular conditions of working. It may assist some in the comprehension of the comparative separation by the present system of hand-dressing, and that of the machine in the above trials, when it is stated that in experiments Nos. III. and IV. the material operated on is of just about the average value for tin of the usual quality of rock stamped at the mine—from 30 to 35 lbs. to the ton—and that after some 40 boys and girls have handled and re-handled it, the tailings flowing down the lower works contain about 8 lbs. black tin to the ton. Below the upper floors are a second set of frames and buddles, giving employment to 15 more hands. Here most of the material is re-worked, but gives small yields, not exceeding 2 lbs. tin to the ton. The tailings finally lost contain about 6 lbs. black tin to the ton. Sufficient has been said in regard to the separation performed by the Vanning machine; indeed, among the great number of practical men who have seen the machine at work, there has been but one opinion on the subject. It now remains to say a little as to the cost of erection and working of such machinery.

At the present time tin dressing in Cornwall is carried on by a series of processes that may be more aptly termed hand labour than machine work; the bulk of the material dressed is fed into buddles by hand, then dug out of the same to be re-fed into other buddles, until sufficiently clean for roasting. The principle upon which both buddles and strips work is the same; the current of water carrying the crushed material flows down an inclined plane, depositing its heavier particles in the order of their weight, the tin and heavier minerals remain in the upper portions of the buddles or strips, while the lighter rock is carried further on. After working a time either a buddle or a strip becomes full, and work must then be stopped until the material fed in is lifted out again in either two or three classes of varying richness. For the hand labour necessitated by these repeated re-workings Cornwall is fortunate in being able to employ small boys and girls at a few pence each per day, and thus, though the methods of dressing are crude, cumbersome, and imperfect in results, and despite the great number of persons employed, the actual cost of preparing the tin is not high. The little power required to drive the small brushes which sweep around the various buddles is almost universally supplied by water-wheels, so that no cost exists other than mere labour cost. Under these circumstances it is not very surprising that any improvement in machinery make but slow progress in Cornwall. Tin dressers, however, have no objection to admitting that the desideratum is a method of dressing up clean at one operation, for the fact cannot be denied that a certain and very appreciable loss of tin occurs at each re-handling of the material in water. These points are mentioned for the following reason—that in estimating the cost of a new process in comparison with the old it is necessary to take into consideration not only the actual cost of dressing per ton of rock,



but also the relative loss of tin involved. Tin is undoubtedly a cheap metal as compared with the ores of the precious metals, but even at the present low price every pound of black tin is worth between 4l. and 5l., and the saving of 2 or 3 lbs. of tin on every ton of material is a matter of no small interest where a great number of tons are worked daily.

Another point of interest as bearing on the statements just made regarding the Cornish method of tin dressing, is the impossibility of putting in improved machinery as an auxiliary to the old plant; it can only supersede the latter; this superseding of the old by the new may be wholly or in part. That is to say, in Cornwall generally there are two distinct divisions of the work—one the dressing of the raw ore, the second the dressing up for market of the roasted produce of the first operation. New machinery may be applied to the latter part of the dressing at a less outlay than to the first, because, of course, the quantity to be treated is much smaller. This is mentioned here in deference to the opinions of several who, having seen the Vanning machine at work, have considered it as more especially adapted to the treatment of the richer or roasted ores.

The question of outlay has an individual aspect when looked at merely as outlay. The commercial consideration of expenditure is based on the returns resulting, not on the amount expended. For this reason the matter must not be looked at too narrowly. In deciding whether any particular works shall make a change in its plan of operation, the considerations involved are more or less personal, dependent on various circumstances, and the question becomes one of expediency, to be settled by those interested; but this does not hold in any comparisons of an old and a new process on general grounds; in this latter case any expenditure is justifiable, and to be recommended when the increased profits resulting constitute a fair percentage on the amount invested.

To enter more into details concerning the Vanning machine. From the experiments at West Seton, and from over 14 months' working experience in America, it can be safely taken that one machine, working directly on stuff from the stamps, will treat 8 tons in 24 hours, which would be all the material from eight heads of Cornish stamps; this has been done at New Consols Mine. Of course, with a very large number of heads stamping, a number of machines would be required, but as they are only 12 ft. by 6 ft., the space taken up is small when they are placed side by side. It may, perhaps, be objected that the rough and the slimes should not be treated on the same machine, and though theoretically this is a fact, as far as regards a perfect separation, the actual working results obtained both in America and Cornwall, in connection with the increased capacity of the machine by so doing, justify such a procedure. To do the very best work a second machine should take all the tailings from the first, and thus extract the tin almost completely; the perfection of this dressing would in all probability pay for the extra expense of a second set of machines, while the extra labour for attendance on the machines would be a very small matter.

In dressing the stamped material direct it would be necessary that the machines should run as long as the stamps are working, which means in most cases day and night work; of course this implies a double running force and superintendence. The absence of motive-power would generally necessitate the erection of a small engine or large water-wheel. Notwithstanding these changes in the system of working, and the extra expense ensuing, it can be shown from carefully prepared estimates that even in working a comparatively small number of tons daily a fair saving can be effected on the actual cost per ton for dressing, and there is no doubt at all but that a much larger saving would result from the increased percentage of tin extracted. In large concerns, where a great quantity of rock is stamped, the saving would naturally be proportionately larger, for the cost in self-working machinery is in diminishing ratio to the increase in quantity worked. The space at present at command will not allow here of a detailed statement of the cost of a change in machinery, but on another occasion we hope to be permitted to enter minutely into the matter.

A general comparison of results can be given however, taking for example the case of the West Seton Mine. The present cost per month for dressing at the mine above mentioned is 78l., giving employment to 70 hands. The cost of running a 40-ton mill properly constructed, allowing for a day and a night force, two overseers, oil for machinery, and a liberal percentage of capital invested for wear and tear, would be 65l. Of course coal is included in this, and the number of hands employed would not exceed 15. At West Seton they do not average 40 tons per day. The saving in cost is here only 12l. per month, but it can be safely taken that 3 lbs. of tin will be extracted from the ton of rock in addition to that at present saved. Such a saving would be equivalent to at least 52l. per month, making total saving of 64l. Taking cost of complete new mill with engine and boiler at 1200l., a liberal estimate, the above saving would be equivalent to a return of 64 per cent. per annum. The above estimate includes the dressing of the roasted "witts." In increasing the capacity of the mill the increase in cost will not be in direct proportion, while the cost of treatment per ton of rock appreciably diminishes.

Dolomath, which treats some 200 tons of stuff per day, would doubtless require a large mill and a great number of dressing machines; but the floors already in use have cost, if report be true, ten times as much as a single mill would require for erection, and the saving in working by machinery so large a quantity of rock would be very great, as we hope soon to be allowed space to prove by figures.

In many of the Cornish mines a vanning machine could be cheaply erected to run by a water-wheel, and dress up with the help of a few lads, all the roasted "witts" from the ovens, saving not only in cost of dressing and extra tin extracted, but indirectly by doing away in many cases with the necessity for re-stamping and re-working the "burnt leavings"—an operation delaying the other work and not productive of much profit anyway. At the West Seton Mine, where about 7 tons of "witts" are roasted per day, it is calculated that a saving by the use of machines would be effected of 30l. per month if run by water-wheel, or 20l. if run by a small engine; and in addition, the ugly pile of "burnt leavings" for subsequent stamping would be done away with.

ON THE COAL TRADE AND STRIKES.—Sir Edward Watkin, M.P., president at the Manchester, Sheffield, and Lincolnshire Railway half-yearly meeting, at Manchester, and, in referring to the affairs of the company, said there had been a decrease in the traffic of the half-year of 33,000, and there had been a decrease of 16,500 in the expenses. After explaining various items of income and expenditure he referred to the South Yorkshire strike. He said the half-year had been disfigured by a strike of eleven weeks in the South Yorkshire coal district, by which he estimated that the company had lost, directly and indirectly, traffic amounting in value to 50,000l. He said that the South Yorkshire capitalists had lost 500,000l., and the workmen in wages 100,000l., and the railway company 50,000l., as he had stated. Yet there were people who said that, notwithstanding protection in America, and trades unionism in England, the commercial interests of this country were safe, and might be prosperous. Two or three years ago, when coal had reached a very high price he had said that high prices would bring about low prices as certainly as one generation beget another. Taking the price of steam coal in the South Yorkshire district, he found that in 1859 the price at the pit mouth was 6s. per ton, and the price per ton 2s. 9d. In 1872 the price per ton was 12s., and wages per ton 4s. 2½d.; in 1873 the price per ton was 21s., and the wages 5s. 5½d. The price had now fallen to 9s. 6d. per ton, and the wages per ton to 3s. 11d. But an unsatisfactory result was that the miner was now producing less for more money. Whereas, in 1859-60 the miner was now producing nine hours a day for 6s. 10d., from 1871 to 1874 he was working eight hours a day for 10s. to 20s. a day. Notwithstanding the reduction in wages which had since taken place the miner was earning from 6s. to 12s. a day for working only eight hours. Even at the present day the cost of getting the ton of coal was 15 per cent. higher as a matter of wages than it was eight or nine years ago. The trade was intimately affected by this state of things, and they found that in consequence of the operation of protection in America, and trade combinations in this country, it was impossible for us to compete in the American markets, or other markets of the world, with our competitors. This was a serious state of matters, and could only be met by reversing our policy. Instead of trying to cut down more and do less work we must try to consume less and do more work. He believed in work, and when he saw Parliament passing restrictions upon the labour of adult men, he wanted to know how and they (the shareholders of that time) would feel if their hours of labour were restricted to nine hours a day. Instead of being the happiest of men—for man was happiest when he was working—they would be the most miserable. He said that working men were made miserable by these Acts of Parliament; but not only so, for they were also made victims by these Acts of Parliament, because what were they to do with the leisure given them? Unfortunately, owing to the state of education

in England, the result is of so much more leisure time given to working men was so much more extravagance and dissipation. With respect to the reduction of fares, introduced by the Midland, he said that he was in possession of figures which would show that the policy had been disastrous to the Midland Company itself, as well as to other railway companies. He did not believe he was wrong in saying that the Midland Company had by their policy abstracted from the pockets of railway shareholders generally 300,000l. a year, and it would have been much better for them to have given Mr. Allport 1,000,000l. to buy himself an estate than to have permitted him to carry out the policy he had done. With respect to the state of trade generally, he regretted to hear that by the suspension of payments on Turkish and Egyptian Loans residents in London alone had received 6,000,000l. less this year than last, and consequently so much less was being spent; and he had it on the authority of Mr. Mundella that the diminution of wages paid in this country was nearly 2,000,000l. a week. It was not surprising, therefore, that the traffic should show a large decrease. He was hopeful, however, that after passing through another year of wholesome discipline England would be able, by reducing the inflation of wages and by doing more work, to outbid all other producers in the world in cheapness; and then we should resume our trade with all markets in the world, for no amount of protection could stand against cheap production.

#### GOLD IN FRENCH GUIANA.

In reporting from Cayenne on the trade and commerce of French Guiana, Her Majesty's Consul tells us that the gold industry has flourished during the year 1875, and that the average yield per month has been 9427 ozs. One gold mine at Sinnamary lately produced a nugget, amongst its other riches, weighing 900 grammes, or nearly 2 lbs. New discoveries of gold have been made at Iracoubo, where hitherto the soil has been unfruitful. The concessions of land for gold prospecting continued to increase during the year, and grants over an extent of 1,111,000 hectares were made during the first six months. Finds also and concessions have been made at Mana and Maroni, but many grants have been abandoned for various reasons. It is, therefore, not to be supposed that gold is to be obtained without very severe labour and trouble. M. Paul Côté, who has published several articles on the French colonies, and among them one on French Guiana as a gold-producing country, predicts for it the position not of one of the first of their colonies, but of the first. According to an unpublished *mémoire*, quoted by Mr. Consul Wooldridge, which contains instructions to a gold company just commencing operations, the greatest part of the metal, it is believed, is to be found in the beds of the rivers and creeks, and this opinion is founded on two reasonable suppositions—1. French Guiana is traversed from south to north by immense rivers, whose currents, very strong during the rainy season, cease to flow with any rapidity during the dry seasons. On each side of these rivers flow creeks, whose sources, like those of the principal rivers, are situated in the Tumac Oumack Mountains, which separate the three Guianas from Brazil. It is already known, continues the author of the *mémoire*, that these mountains are the origin of all the gold mines found in Brazil (?); and the geological conformation of French Guiana being identical with that of Brazil, it is logical to conclude that the gold spread over French Guiana also comes from these mountains, brought down by the rains. The heavy particles have remained in the beds of these rivers, while the lighter ones and the dust have been scattered over the plains.—2. That these gold-bearing beds come from mountains in the interior of the colony, and have been washed down in a similar manner. Whichever opinion is right, it seems to be an undoubted fact that gold exists in the beds of all the rivers in much greater quantities than on the land, but in the search for it great difficulties will have to be encountered. The first streams that the company will explore are the Oyac, the Orapa, and the Comté, whose beds are known to be rich in gold, for placers abound along their banks. The *mémoire* proceeds to lay down the *modus operandi* to be pursued in prospecting by the company, to which we wish all success.

#### THE COAL FIELDS OF ALABAMA.

A just-published consular report from Mobile contains some interesting information on this subject, from which we condense the following particulars. For some time past considerable attention has been attracted to the project for opening the Coosa river to navigation, in order to secure an outlet for the coal and iron of Alabama through the port of Mobile, and Her Majesty's Consul reports that great confidence is felt in the ability of the people to accomplish the work; it is believed, indeed, that every effort will be made during the current year to prosecute this most important undertaking. The Coosa coal fields, extending across and cropping out from the banks of the Coosa river, cover thousands of square miles. The deposits are immeasurable, and are of the very best quality; they lie immediately at or near the surface, convenient for mining and shipping. The beds begin near the celebrated Montevallo Mines, 75 miles from Wetumpka, and extend under different names with rare intermission along the entire line of the river into the mountains of Georgia and along the banks of the Tennessee. The quantity which can be easily mined is sufficient to supply the demand of the entire world for ages to come. Although the production of coal in Alabama is as yet very limited, and the first cost higher than it need be from want of competition in the market, it is shown by the United States Census Report of 1870, taken at a time when labour was greatly demoralised and uncertain in that part of the Union, that the average cost of coal at the colliery was less in Alabama than in Virginia, Tennessee, Missouri, Iowa, Kansas, Michigan, Rhode Island, Kentucky, or in any of the Western territories. Want of labour, want of economy in the organisation of the mines, high prices of coal at the local markets, and want of capital appear to have all combined thus far against the Alabama mines, but, notwithstanding all these difficulties and drawbacks, the cost of coal at the collieries can even now compete in cheapness with that of most of the States.

When a cheap water channel shall afford easy and commodious transportation, and when the coal on the banks of the Coosa river shall be delivered at once into barges, it will be found that its first cost can be reduced below that of Maryland, The Maryland and Pennsylvania coal fields are often closed against their markets by ice and snow, and their labourers interrupted by the winter. Coal is accumulated in the Atlantic cities in advance of winter, and the mining companies see their capital lying idle for months. The Coosa river, however, would never be closed, capital would be always actively employed, and miners in that region would never be interrupted by snow and ice. The price of bituminous steam-making coal in the leading markets from which Mexico, Cuba, and the West Indies can be supplied may be put down about as follows:—

Baltimore, per ton (say)	16s. to 20s.
Richmond "	20s. to 18s.
Philadelphia "	18s. to 20s.
New Orleans "	18s. to 20s.
At Mobile it is now 24s., but with improved rivers the greatest cost will be 14s.	
The bituminous coal exported from the United States in 1873 was 1,086,253 tons. To the countries which lie convenient to the Gulf of Mexico, the exports were:—	
Brazil .. .. .	Tons 1,735
Hayti .. .. .	175
Mexico .. .. .	2,399
Cuba .. .. .	30,311
Danish West Indies .. .. .	15,511
French .. .. .	13,757
British .. .. .	2,443
Columbia .. .. .	6,383
Total .. .. .	75,884

Great Britain supplies Brazil annually with 350,000 tons of coal, every ton of which could be furnished by Georgia, Alabama, and Tennessee in exchange for coffee and other tropical products. With the Coosa River opened to Montgomery and the Alabama to Mobile, the latter place could ship cheaper and better coal than Philadelphia, Baltimore, or Nova Scotia. Including only New Orleans, which consumed last year 375,000 tons, the coast towns, the Gulf shipping, the West Indies, Mexico, and Brazil, there would be a demand on the Alabama and Tennessee mines of 1,000,000 tons of coal per annum, an amount which would distribute one million sterling among the people of that section of the country from which Her Majesty's Consul writes. Besides the coal consumed at Mobile and shipped abroad and coastwise, it must be borne in mind that vast quantities would be consumed inland whenever the price of coal is put below the cost of other fuel. The towns, villages, forges, factories, and furnaces which line the waterway will all add to the demand. What this demand will be within a very short time after the opening of

the Coosa route may be guessed at when it is known that the tonnage of coal from the Pennsylvania mines amounted for the year preceding September, 1875, to over 16,000,000 tons.

Her Majesty's Consul concludes his remarks by giving some estimates of the probable cost of Alabama coal laid down at various places, and the amounts of coal conveyed last year by certain canal companies and railroads. All his vaticinations respecting the future of the Alabama coal fields are, however, dependent for their realisation on the Coosa river being put in a navigable condition, or on the removal of the necessary obstructions, and that work, it is believed, will cost close upon 600,000l.

#### MINING AND METALLURGY AT THE AMERICAN INTERNATIONAL EXHIBITION—No. III.\*

The mining and metallurgical display of Great Britain (of which future mention will be made) is far below that of her dependencies—that of the British colonies in North America and the great island Continent of Australia being remarkably comprehensive. The Australasian colonies, with an eye to business, have each set forth their advantages in the most attractive form, and present all possible encouragement to emigration by the exhibition of mining, agricultural, and pastoral statistics, prices of provisions, wages of mechanics, &c. The continent of Australia, closely approximating in area the United States, is at present divided into the five provinces of Queensland, New South Wales, Victoria, South Australia, and Western Australia; all of which (except the latter) are well represented at the Exposition. All of it is new country, New South Wales (which formerly included all but the province of Western Australia) having been discovered by Cook in 1770. By reason, then, of seniority we first give place to the interesting exhibit of the province of New South Wales, which has an average breadth of 500 miles, and an average length of 650 miles. The present population numbers about 600,000. The New South Wales Court has two prominent trophies; the first is a model of a parallelopipedon, covered with gold foil, to represent the output of the gold mines in the colony from 1851 to 1874. The quantity represented is over 8,000,000 ozs., and the product is valued at about \$158,000,000. Around the base of the model are piles of copper ingots, pig tin, bar tin, and a case of grain tin. There are also photographs of some of the remarkable specimens removed from the diggings. One of these illustrates a specimen 4 ft. 9 in. high, 2 ft. 2 in. wide, and averaging 4 in. in thickness, containing an immense quantity of gold; the weight was 630 lbs. and the value \$60,000. Another photograph displays \$310,000 worth of retorted gold, the result of one crushing.

There is quite an elaborate display of specimens characteristic of the gold deposits which, according to the mineral maps exhibited, seem to be tolerably well distributed throughout the colony.

The second trophy is composed of sections of eight of the coal veins, which vary from 8 ft. to 14 ft. 6 in. in thickness, mostly taken from the great coal basin of which Sydney is the commercial centre, averaging about 100 miles in width, and extending 400 miles along the Pacific Coast. The base of the trophy carries some good magnetite, titaniferous and brown hematite iron ores, and a pig of iron made at the furnace of the Lithgow Iron Company, which we believe is the only blast-furnace in Australia. The proximity of the iron and coal fields, and their location so close to the seaboard, should augur a bright future in iron production for New South Wales, and the varieties of ores and coals exhibited give promise of opportunity for selection of material.

The display of tin ores is very comprehensive, including extra fine specimens, masses, washings, &c.; in several cases the lode tin is shown in position; some of the alluvial ore is called wood tin on account of the grain of its fracture, and the smaller washed specimens bear the name of stream tin.

The mass of the tin deposit is in the north-eastern section of the colony adjoining Queensland, and in the same locality are found the gem stones, such as diamonds, sapphires, topaz, and chalcodony. Copper ores in considerable variety are displayed, mainly carbonates and sulphides, with some little native. To the liberal display of auriferous quartz may be added fine specimens of galena and of the ores of antimony and arsenic.

The geology of the colony is illustrated by a variety of palaeontological specimens, displaying the fauna, flora, &c.

One of the remarkable productions of New South Wales is kerosene shale, which extend over an area of about 600 square miles, distributed through the coal fields. The large mass exhibited very much resembles in general appearance cannel coal, and bears upon it the statement that the vein is 3 ft. 2 in. thick, and that a ton of the shale will produce from 150 and 160 gallons of crude oil; or that from it can be generated 18,000 ft. of illuminating gas of 40-candle power. The output of kerosene shale is somewhat over 100,000 tons, and the average price in the past 10 years is equivalent to about \$13 gold per ton.

Queensland is not behind her neighbour in the South in setting forth the advantages of the colony to those in search of an Eldorado, and in the centre of its court a gilded obelisk over 20 ft. high stands to represent the gold exported from 1868 to 1875, amounting to over 65 tons, and valued at \$35,000,000. The display of gold ores is less comprehensive than that of the New South Wales court; but the individual specimens are superior, especially for cabinet use. Around the walls of the court are hung coloured photographs exhibiting the peculiarities of the colony, and among these are a number illustrating the mining industries. The walls are also adorned with a complete collection of geological charts, mining statistics, &c.; the geological is also exemplified by specimens of rocks. Some gold nuggets and auriferous quartz represent the mining of this precious metal, which is claimed to be on the increase only in Queensland. The copper display is of remarkable interest; a fine mass of native copper weighing nearly 900 lbs. stands beside a boulder of malachite, rivaling this boasted product of Russia; there are also carbonates and sulphurets of copper, and several tons of ingots exhibited.

In connection with a like quantity of tin ingots, there is a complete collection of the tin ores from the Stanthorpe district, the principal deposit of these ores lying near the boundary of New South Wales. Stream tin, wash-dirt, &c., are on exhibition. Cinnabar, antimony ore and regulus, native bismuth, carbonate of bismuth, and ore containing 77 per cent. of peroxide of manganese are displayed.

The iron ore displayed is small, consisting of hematites and chrome irons. There are a number of samples of coal and coke produced from it on exhibition. The elegant collection of opals, chalcodony, and agates attest to the richness of the colony. The Government, with true progressive spirit, has prepared an exhaustive display, and sent out special agents to investigate industries and processes, and purchase for the colony the most approved machines and appliances. As we stood in the Queensland court and took a survey of the resources exhibited, we could not but wonder what its future development will be when the 180,000 people who now inhabit this colony, nearly three times the area of Texas, shall have given place to the millions who may unearth many yet hidden treasures. Victoria, which in 1851 was made a separate colony out of the southern section of New South Wales, boasts of being the least in area and the greatest in population of any of the Australasian colonies. No model of gold export decorates her court, but over the doorway is hung a statement exhibiting the gold output of each of the colonies of Great Britain in the South Seas, which foots up to \$345,000,000; below this total is placed the gold production of Victoria, \$375,500,000—a truly wonderful amount, and yet, adding the output of Victoria to that of the other colonies, the amount is but 90 per cent. of the gold produced in America since the forties.

A case containing *fac-similes* of remarkable gold nuggets give an indorsement to the figures above quoted, and form the prominent features of Victoria's display of mining and metallurgy. The Government gives great prominence to the exhibit of truly remarkable cereals and agricultural products. There are, however, specimens of auriferous rocks and quartz, nickel, antimony, and lead ores, and samples of various metals smelted in the colony. A rather crude model of a safety mining carriage forms a part of the exhibit.

\* No. II. appeared in the Mining Journal of July 22.



The facsimiles of gold nuggets are sufficient to encourage a stampede to Melbourne, and encourage dreams of fortunes made in a day. Among them may be named the "Welcome" nugget, weighing nearly 2200 ozs.; the "Viscount Canterbury," over 1100 ozs.; and the "Viscountess Canterbury," over 885 ozs. Although but few wonderful specimens have been brought to light in late years, there is no reason to imagine that the diggings are worked out of a country as great in area as England, Scotland, and Wales, inhabited by fewer people than reside in Philadelphia. However, the gold fever is over at Melbourne, and now emigration is invited by the encouragements offered by the surer and safer industries of grain and stock raising. —Iron Age (New York).

**MINING TOOLS AT THE PHILADELPHIA EXHIBITION.**—The Hardy Patent Pick Company, of Sheffield, England, exhibits a very fine collection of picks and handles in the English Department of Machinery Hall. These picks, curiously enough, were invented in 1869 by C. A. Hardy, of Philadelphia. Their manufacture on a commercial scale has, however, only been carried on in England, and after five or six years of successful working there they are now brought back here to serve as a proof that England is not always conservative in adopting a good foreign invention, even though it may not have been appreciated at home. The original invention of Mr. Hardy consisted in the fitting of a malleable iron socket piece to the feather of the handle in which the pick was fastened by a set screw, it being made solid without an eye. The pick as now made fits in a similar malleable iron socket, but instead of being held in place by a set screw, it is secured by a steel wedge and cotter which bears up against the under side of the pick. The pick is slotted on the upper side, and is pressed up by the wedge, so that it is firmly held by the top of the socket. This form of handle is much used with light straight mining picks, and it is said to work well. When it is necessary to frequently sharpen the picks this form is especially valuable, both on account of the readiness with which they are removable, and also because the cost of making these heads is less than those having "eyes." Another form of pick made by the Hardy Company has a ferrule on the handle, and the ferrule is split into two halves for some distance from the top. When the pick is driven on in the ordinary manner the ferrule contracts at the slit slightly, its elasticity helping materially to keep the pick firmly fixed in its place. A third form of handle is made with a solid ferrule on the handle, the ferrule being recessed on one side in which fits a slightly tapering half round wedge. An ordinary eye pick, when driven on this kind of ferrule, is firmly held on this taper wedge. A change in the size of the wedge makes it possible to use picks having different-sized eyes on the same handle. All picks made by the Hardy Company are of solid cast steel, and are polished. Their exhibit includes almost every variety of mining pick and ordinary pick used in this country, and also special kinds of handles. Where it is necessary that the latter should be quite short, they are made with long iron ferrules, which give them the weight possessed by longer handles.—The Verona picks are made by the Verona Tool Works, of Pittsburg, Pa. Several specimens of these picks are to be found in the collection of manufactured steel products exhibited by the Crescent Steel Works of Pittsburg, in the Main Building. The picks are made of solid steel from the Crescent Works, which fact is a sufficient guarantee of the good quality of the material out of which they are constructed. The Verona Company make a variety of these picks for mining and other purposes, the different forms of which are illustrated in the advertising columns of this journal. One noticeable feature in these picks is the substitution of a tubular cheek to the eye, which makes the picks hold much more firmly to the handles than do those which have the old fashioned pointed cheek.—Messrs. Klein, Logan, and Co. make a very good display of their goods in the Main Building, among which are quite a number of mining picks and sledges. Some of these are made of solid steel, and in the construction of the eyes and their general finish they are much like those made by the Verona Company. —Engineering and Mining Journal (New York).

THE CLEVELAND IRON TRADE.

The publication of the Ironmasters' Statistics for the Cleveland District for June enables a more accurate view of the present position and future prospects of the Cleveland iron trade to be taken, and it must be confessed that they reveal also the depth of the depression which the whole trade feels. The facts are apparent that the state of trade has forced a reduction in the make of pig-iron in Cleveland district, and in spite of the reduction and of the enlarged amount sent out of the district, there is an increased quantity accumulating in the hands of the makers. Since the beginning of the present year the stocks of pig-iron held by makers in the Cleveland district have doubled, and they now amount to the largest quantity so held in these boundaries of recent years—132,712 tons, although the make monthly has fallen from its maximum—attained towards the end of last year. The returns to which we have alluded show that the 117 furnaces in blast in the North of England made in June 171,673 tons. Of this amount a large quantity, 29,704 tons, is shipped foreign—Germany, Holland, and other European countries taking large amounts; and 27,350 tons are sent coastwise to other British districts—notably to Scotland and Wales. Both these amounts are above the average shipped out of Cleveland at similar periods of the year; and locally it is known that a larger amount than ordinarily is being used in the North of England for foundry purposes. In spite, however, of this, the small consumption for malleable iron purposes lessens so materially the demand, that there has been for some time a monthly increase in the stocks held by makers. This fulness is due to the want of orders for rails—the mills for rolling which take, in times of normal prosperity, no less than 32 per cent. of the whole of the crude iron made in the North of England. The stagnation in the rail trade has, of course, affected the demand for pig-iron that the price in Cleveland has fallen continuously, although it is believed that it has now reached nearly its minimum—the rate being indicated by a standard of 45s. per ton for No. 3. This, then, is the state of the northern iron trade. Out of 153 blast furnaces in the North of England some 41 are out of blast; out of about 2200 puddling-furnaces nearly three-fourths are now inactive; and nearly every rail mill in the North of England is working irregularly, or is altogether closed.

It is needless to dilate upon the derangement this state of affairs necessarily causes in the North of England. It finds a reflection in the South Durham coal field—a large portion of the produce of whose fields was used at the ironworks; in coke ovens, through the reduced quantities used at the blast-furnaces, and for the same reason at the iron mines of the limestone quarries; and necessarily this widening influence is felt in all commercial circles. It must be admitted also that the prospect is not a reassuring one—at least, so far as the immediate future is concerned. Although it is hoped that there may be a little less decline in the rail trade, yet at present appearances indicate that any gain in this direction will be more than counterbalanced by a loss in the next largest constituent of the finishing iron trade—that of plates. Fewer orders are now being booked by the shipbuilders, and hence the demand for plates must fall off, both for shipbuilding and boiler-making purposes. The remaining branches of the trade—angle and merchant iron—are only small comparatively in Cleveland, and thus the prospect for the finishing trade is gloomy, unless some imperial event should change it. Directly that gloominess is diminished for the chief support—the malleable iron trade—the demand is materially diminished for the chief support—the malleable iron trade. Still, so far as the North of England is concerned, this great falling off seems likely to continue to be met, in part, by the increased demand from districts foreign to it, a demand stimulated by the great cheapness of Cleveland iron at present; and as there is a probability of a further increase of the number of cold furnaces, by the blowing out of two or three of the oldest for repairs, it is probable that the stocks will not much further decrease—rather the contrary. If this is the case the demand will cause a re-lighting of some of those now blown out, and although it is evident that there is a very small profit, only obtainable with pig-iron at the low figures we have named. But this probable adjustment of supply to demand and stock is one of the brightest features in the prospects of the English iron trade. And if there be any early resumption of railroad making on a large scale in Europe there must be a resort to the mills in Cleveland, for no European iron making district has such immense and contiguous stores of the raw material for iron making as it has, and in no district are there larger or more complete rail mills. But this, it is evident, can only be in the future, and for the present the darkest colours only are needed to paint the outlook for the iron trade of the North. It is generally known that extensive experiments are now being conducted, first, on a large scale Mr. I. Lowthian Bell's patent for producing homogeneous rails from Cleveland iron, and it may be noticed that at Eton the first furnaces in Cleveland for applying the Bessemer process are making rapid progress, so that the gleams of hope for the district increase. But at present there is at the iron mines a stocking of ironstone. At the blast-furnaces the stock of pig iron is rapidly increasing, so rapidly that ironmasters deem this the fittest time to endeavour to obtain a long desired reduction of 1st furnacemen's wages, and at the rail mills which are working, with the exception of the Consett Works, small orders for light sections are the rule. Meantime prices seem to have reached their minimum, for prices of raw materials can scarcely fall lower, and without this a loss on the sale would be the result from lessened rates for iron. Altogether the belief is felt that the turning point is now about being touched, for with lower rates, with efforts to improve the processes and manufacture on the verge of successful demonstration, it is felt that the long delayed demand must set in, and the depth of the depression in the great industry of the North will then have been fathomed, whilst the reductions accomplished and expected in the wages of miners and blast-furnacemen will give some ease to makers, and enable them to accept current rates without loss.

**THE FATAL COLLIERIES EXPLOSION AT CWMARN.**—About 15 months ago the Ebbw Vale Company commenced sinking a pit at Cwmarn, at the foot of the Mynyddmaen Mountain. The shaft has been sunk to a depth of 152 yards. There are three shifts employed at the pit, each consisting of a "leader" and nine sinkers. The shifts change every eight hours, and the set that was working had gone down at 2 o'clock, P.M. At 6 o'clock, after firing a shot, they came up to "break," or what would be their principal meal, for which half-an-hour is allowed. After the meal the leader of the set, Hy. Atkins (Rice), and three sinkers, as "Tom Penrhilwies," (Abercarn), and Thos. Davies, better known as "Tom Penrhilwies," (Abercarn), proceeded down the pit. Soon after their descent the pit was turned completely over, burying those on the surface, and the covering, however, was rescued comparatively unhurt. A top man named Charles Roberts, a nephew of the ganger, was blown about seven yards, he, too, escaping without injury. A man, named William Hopper, was struck on the side of the head by some of the falling debris, and others were cut on the arms and face. Davies was much burnt about the back of the head, but not dangerously. A cry was heard from the shaft—"Wind up for God's sake," and this was done without delay. Tom Penrhilwies was drawn up with Mr. Williams in his arms, but the latter died a few minutes, repeatedly calling for water. Help soon arrived, and water was pumped down, and a steam main also erected for the purpose of sucking up the sulphuric acid; but it was fully two and a quarter hours before an attempt to de-

scend could be made, and this was done by Mr. D. Evans, surveyor to the company J. Marsh, an overman, and Henry Penrhilwies (brother to Tom). After going very slowly down some distance, a call was made "wind up," and it was manifest that the pit was full of gas from the explosion. Attempts were made about every half-hour to descend, but it was found impossible to penetrate below with lights. Mr. Pond, the manager of the company at Abercarn, Mr. J. T. Green, manager of the Newport Abercarn Company's pits, and Mr. Howell, who has the contract for sinking at Risca, went down without lamps, and eventually succeeded in finding one of the bodies, which they immediately brought to bank. Descending again they brought up another body. The deceased men leave wives but no children. They were frightfully burnt, and one of them had the upper part of his face blown away. Dr. Davies was soon on the spot, as were also Mrs. Green and Mrs. Pond, but no assistance could be rendered.—South Wales Daily News.

THE IRON INDUSTRIES OF WILTSHIRE.

By RICHARD MEADE, Assistant Keeper of Mining Records, Museum of Practical Geology.

**MANUFACTURE OF PIG-IRON.**—In a previous notice attention was directed to the ironstone deposits of Wiltshire, occurring and worked in the neighbourhood of Westbury, in the coral rag; at Seend, near Devizes, in the beds of the lower green sand; and of other deposits in the counties of Oxford, in the marlstone or middle lias; in Hants, in the Bagshot beds; in the Isle of Wight, on the shore between Yarmouth and Hempstead ledge; and in Buckingham, at Leighton Buzzard and Linslade, in the lower green sand; details of production and analyses of these brown iron ores followed. It is now proposed to trace the manufacture of pig-iron in Wiltshire and in Hampshire.

In the year 1857 the Messrs. Greenwell and Co. commenced operations by the construction of the ironworks at Westbury, conveniently situated to the railway station of the same name. In the following year the first furnace was put in blast; the yield for the year 1858 is not separately distinguished, being included in the production of the Pennywell Road furnaces, of the Messrs. Langford and Co., of the adjoining county of Somerset, which amounted to 2040 tons of pig-iron. In the following year the works at Seend were laid down by the Messrs. Sarl and Sons, who commenced the erection of two furnaces. The iron ore raised at this period from the mines in Great Britain and the production of pig-iron, the yield of 125 blast-furnaces then in operation, will be seen in the following abstract—for 1859:

District.	Mines.	Tons.	Furnaces in blast.	Tons.
Cornwall	28	35,213	—	—
Devonshire	8	8,595	—	—
Somersetshire	5	59,084	1	5,000
Gloucestershire	11	106,202	6	31,750
Wiltshire	3	28,993	2	5,500
Hampshire	3	9,725	—	—
Northamptonshire	7	130,059	3	12,800
Warwickshire	—	30,500	—	—
Oxfordshire	3	6,030	—	—
Lincolnshire	1	2,000	—	—
North Staffordshire	—	624,000	23½	143,500
South Staffordshire	—	825,000	12½	473,300
Shropshire	—	197,589	30	149,480
Derbyshire	—	325,500	27	139,250
Yorkshire, West Riding	—	175,000	24	84,950
ditto North Riding	15	1,520,343	23	216,127
Northumberland	—	13,330	6	31,500
Durham	—	—	49	370,000
Lancashire	21	403,177	7	50,000
Lancashire	23	445,046	7	26,491
North Wales	5	87,072	6	26,890
South Wales	—	619,758	147	985,290
Ireland	1	3,000	—	—
Isle of Man	1	1,282	—	—
Scotland	—	—	125	990,550
Totals	—	7,876,581	607	3,712,904

In comparing the above returns of ore raised and pig-iron produced the quantities represent the individual produce of each district. The pig-iron taken in any district must not be taken to represent the yield of the ore of the same district, from the fact that many of our ironworks—as, for example, those of Durham—are mainly supplied with ironstone from the Cleveland district, and imported ores from other districts and foreign countries. Again, South Staffordshire, in addition to her own important argillaceous ores, receives considerable supplies from Northamptonshire and other sources, the yield of which is included in the district into which the ore is thus imported and smelted.

The average market prices of pig-iron "mixed numbers" at the period above referred to (1859) were as follows per ton:—Welsh pig, 3l. 15s.; Scotch pig, 2l. 12s.; Cleveland pig, 2l. 13s. 3l.; and Staffordshire pig, 3l. 15s. 9d.

Resuming with the year 1860, we find the Seend Works first in operation, those of Westbury were also active, and the recorded make of both works amounting to 21,785 tons, the yield of four furnaces, or an average make of 5446 tons per furnace. In the year 1861 the Seend Works appear to have been standing, while those of the Westbury Company were but partially employed, there being but one furnace in blast for a period of eight months; at this period and in subsequent years the production of the Wiltshire furnaces is included with that of the Somersetshire works.

Before giving the united production of the furnaces of Wilts and Somerset, it is only necessary to add that the Westbury Company put up a third furnace in the year 1862, and a fourth about the year 1865. The works at Seend appear to have been in abeyance for some years, since 1860; later a change of ownership took place, and in the year 1870 we find the Messrs. W. and S. S. Malcolm and Co. renewing the manufacture of pig-iron with one furnace in blast, increasing the number in later years to two. A change of ownership again occurred in the year 1874, when the works were carried on by the Duval Iron and Coal Company, who do not appear to have had any furnace in operation in that year. The following abstract shows the production of the Wilts, Gloucester, and Somerset furnaces in each of the years named:—

Years.	Wiltshire.	Gloucestershire.	Somersetshire.	Total.
	Furnaces.	Furnaces.	Furnaces.	Pig-iron.
1861	4	2	—	40,493
1862	5	2	—	51,968
1863	5	3	—	64,001
1864	5	3	—	65,312
1865	5	3	—	65,471
1866	5	3	—	69,817
1867	5	3	—	71,199
1868	5	3	—	75,847
1869	5	3	—	81,306
1870	5	4	—	93,601
1871	7	5	—	99,997
1872	7	5	—	144,355
1873	7	5	—	149,944
1874	7	5	—	155,115

An examination of the above totals of production of pig-iron for a few years show the average make per furnace to have been 8851 tons in the year 1872, compared with 8157 tons in 1873, and 8778 tons in 1874; while in the year 1860, as previously stated, the yield per furnace did not exceed 5469 tons, showing considerable increase.

**ORE AND COAL USED IN THE MANUFACTURE OF PIG-IRON.**—A careful analysis of the materials employed in the Wiltshire furnaces enables us to ascertain that the average quantities of ore employed varies from 64 to 65 cwt. to each ton of pig-iron made; the yield of the ore in metallic iron varying, as stated in the analysis of the Westbury ore, from 38 to 41.99 per cent. The quantity of coal employed in like manner in the production of each ton of pig-iron does not exceed 55 cwt.; this includes the coal used for calcining the ore, for heating the blast, engine coal, &c., coke alone being used in the blast-furnaces in the smelting of the ore, which is computed in the above 55 cwt. as coal. The actual quantity of coal employed in the Wiltshire furnaces in the manufacture of pig-iron amounted in the year 1872 to 127,255 tons, in the year 1873 to 119,793 tons, and in the year 1874 to 91,333 tons. The coal employed by the Westbury Company at their furnaces is obtained from their own colliery at Newbury, near Nettlebridge, in Somersetshire; it is previously coked, as before stated, and is found to work well in the blast-furnace.

Thirty years previously—in the year 1840—it was stated by Mr. G. R. Porter in his paper on the Progress of the Iron Industries in Great Britain, read at the meeting of the British Association in the year 1846, that Mr. Wm. Jessop, of the Butterley Ironworks, in Derbyshire, instituted a careful enquiry into the question of the consumption of coal in the make of pig-iron, which embraced the production of every ironworks in the kingdom. This return, which we give in detail, will serve as a useful basis of comparison, the pig-

iron made in that year amounting to 1,396,400 tons, consuming in its manufacture 4,877,000 tons of coal.

Districts.	Furnaces.		Pig-iron made. Tons.	Coal used Tons.
	Built.	In blast.		
Forest of Dean .....	4	4	15,500	5,000
South Wales .....	163	133	505,000	1,438,000
North Wales .....	15	12	26,500	110,000
Northumberland .....	8	6	11,000	32,500
Yorkshire .....	32	25	66,000	308,500
Derbyshire .....	18	13	31,000	125,000
North Staffordshire .....	16	7	20,500	85,000
South Staffordshire .....	135	118	407,150	1,582,000
Shropshire .....	31	24	82,750	470,000
Scotland .....	70	64	241,000	723,000
Total .....	400	402	1,396,400	4,877,000

Thus, in the year 1840, from the above returns, we find the average yield of the blast-furnaces in Great Britain was 3488 tons, while the quantity of fuel consumed in each ton of pig-iron manufactured amounted to nearly 70 cwt. In the year 1869 the enquiries instituted by the Royal Coal Commission led to the fact that 60 cwt. of coal was the average quantity employed. Later in the year 1872 and since, the Mining Record Office has made this question one of special enquiry, and the result shows that the quantity now employed does not exceed in the making of each ton of pig-iron from 50 to 51 cwt. In England and Wales the average appears to be about 50 cwt. of coal, and in Scotland 55 cwt., raw coal being principally employed in the Scotch furnaces.

The following statement for the years 1872, 1873, and 1874 will show the production of pig-iron in Great Britain, and coal used in its manufacture:—

1872.	Pig-iron.	Coal used.
England	4,694,614	11,385,343
Wales	1,057,315	2,607,887
Scotland	1,090,000	3,215,000
Total	6,741,929	17,211,729
1873.	Pig-iron.	Coal used.
England	4,688,199	11,800,891
Wales	885,252	2,184,000
Scotland	993,000	2,730,000
Total	6,566,451	16,714,891
1874.	Pig-iron.	Coal used.
England	4,417,139	11,560,891
Wales	786,592	1,765,151
Scotland	607,617	2,145,199
Total	5,891,408	15,292,201

It will be remembered that in the year 1872 a considerable increase took place in the cost of coal, and in the manufacture of pig-iron, leading to higher prices than had ruled in previous years. To show the fluctuations in the prices of pig-iron per ton since that period, the following statement is selected, and exhibits the highest, lowest, and average prices per ton of the following descriptions of pig-iron in each of the years 1872, 1873, and 1874, deduced from the weekly quotations of each description at the place of manufacture:—

1872.	Highest price.	Lowest price.	Average price.
Welsh pig, in Wales	£7 5 0	£5 0 0	£6 12 0
Scotch pig, Clyde	7 7 6	4 1 0	5 19 0
Cleveland pig, Tyne and Tees	6 2 0	4 0 0	5 4 8
Shropshire, at works	5 5 0	4 15 0	5 7 0
Northampton, at works	6 15 0	4 6 0	5 14 0
1873.	Highest price.	Lowest price.	Average price.
Welsh pig	£5 15 0	£5 15 0	£5 10 6
Scotch pig	7 19 0	5 16 0	6 10 6
Cleveland pig	6 7 6	4 10 0	5 15 0
Shropshire pig	6 0 0	6 15 0	6 0 0
Northampton pig	9 15 0	5 15 0	6 7 0
1874.	Highest price.	Lowest price.	Average price.
Welsh pig	£5 15 0	£5 5 0	£5 7 6
Scotch pig	5 12 3	4 6 0	4 19 0
Cleveland pig	4 12 6	3 7 6	3 15 8
Shropshire pig	8 10 0	5 17 6	7 1 0
Northampton pig	5 15 0	4 0 0	4 9 9

**LIMESTONE AND CHALK AS FLUXES.**—The immediate districts of the iron furnaces in Wiltshire furnish valuable materials for this purpose as reducing agents in the smelting of the ores. Two materials are at hand and employed—the one an oolitic limestone, the other a hard chalk, both rich in carbonate of lime, as will be seen by the following analyses of each variety:—

Carbonate of lime	Oolitic limestone.	Hard chalk.
Magnesia	91.833	0.796
Oxide of iron	0.796	0.158
Oxide of manganese	0.721	0.110
Alumina	1.109	0.584
Potash	0.584	0.610
Soda	0.610	0.597
Sulphuric acid	0.597	Trace
Phosphoric acid	Trace	1.204
Silica	1.204	1.65 = 100.00
Water and loss	1.65 = 100.00	0.41 = 100.00

The other material employed—the hard chalk—is composed of the following constituents:—

Carbonate of lime	Hard chalk.
Magnesia	0.104
Oxide of iron	0.158
Silica	1.110
Chloride of sodium	Trace
Carbonate of iron	2.677
Alumina	Trace
Phosphate of lime	0.523
Sulphate of lime	0.133
Organic matter	1.805
Water and loss	0.41 = 100.00

The Westbury Iron Company (Limited) had on view in the Exhibition of 1862 a most interesting and instructive series of the materials employed, and the products of their furnaces, which they subsequently presented to the Museum of Practical Geology, where they are now deposited, and may be studied. The case containing the collection will be found on the principal floor at the south-east corner, amongst the specimens illustrating the manufacture of iron. It comprises samples of the Westbury ore, of the brown and green varieties, and of the oolitic limestone and hard chalk used as fluxes, examples of the various qualities of pig-iron, from Nos. 1 to inclusive, exhibiting the structure and character of each variety, and the cinder obtained therefrom. Bright iron, mottled, and white iron, also refined metal, are illustrated in the series, together with the cinder produced by each variety; there will also be found in this collection some very curious and interesting products derived from the furnaces, amongst which may be named cyanide of titanium, and an artificial graphite known as "kish."

**HAMPSHIRE—MANUFACTURE OF CHARCOAL PIG-IRON.**—A few years since, about 1863, the Messrs. Harrison, Ainslie, and Co. erected a blast furnace at Warsash, near Titchfield, in the above-named shire, for the manufacture of pig-iron with charcoal; this furnace was put in operation in the year 1869, and has since that time continued with occasional intervals to make charcoal pig-iron according to the supply of charcoal obtainable from time to time in the neighbourhood and in the South of England.

The same firm have other furnaces at Bonawe, in Argyshire; at Newland, near Ulverston, and Backbarrow, near Haverthwaite, both in Lancashire; and a fifth at Daddon, in Cumberland. The above-named furnaces of the Messrs. Harrison, Ainslie, and Co. are the only examples now remaining in Great Britain in which charcoal is alone employed in the manufacture of pig-iron. The ore smelted in all the above works being the rich red hematite of Lancashire—yielding from 64 to 66 per cent. of metallic iron—and derived from the mines of the firm situated near Ulverston, the quantity of iron annually produced is not considerable, but it enjoys a high reputation, always finding a ready market from its superior quality, and for toughness and strength may compare with the best charcoal iron of Sweden, Norway, and Russia.

A noticeable feature connected with the Warsash furnace, which is identical in form with the other furnaces of the firm above referred to, is that suitable mechanical arrangements have been successfully introduced, by which the gases escaping from the top of the furnace are utilised and made available as a source of heating power in raising steam, and for the other purposes in which steam power is employed in the Warsash works.

We have no precise information as to the quantity of charcoal used in the manufacture of each ton of pig-iron in the above-named furnaces, but referring to Mr. I. Lowthian Bell's "Notes of a Visit to Coal and Iron Mines and Ironworks in the United States," we there find that the average consumption is set down at 110 bushels of charcoal to each ton of pig-iron made, and assuming each bushel of charcoal to weigh 22 lbs., we have a fairly reliable average of the



Consuming in  
Coal used,  
Tons.  
1866, 1,456,000  
1867, 1,456,000  
1868, 1,456,000  
1869, 1,456,000  
1870, 1,456,000  
1871, 1,456,000  
1872, 1,456,000  
1873, 1,456,000  
1874, 1,456,000  
1875, 1,456,000  
1876, 1,456,000

quantity employed. The production of charcoal pig-iron in the United States is shown for a few years in the following abstract:—

Year.	Tons.
1871	585,000
1872	50,587
1873	624,127
1874	199,804
1875	135,394

The total production of pig-iron in the United States, including charcoal and coke pig-iron, amounted to the following quantities in each of the same years; side by side will be found for comparison the production of Great Britain:—

Year.	United States.	Great Britain.
1866	1,350,343	4,523,897
1867	1,461,628	4,761,028
1868	1,603,000	4,970,208
1869	1,814,641	5,447,757
1870	1,865,000	5,993,515
1871	1,912,608	6,827,179
1872	2,830,070	6,741,929
1873	2,695,434	6,566,451
1874	2,689,413	5,991,418
1875	2,266,551	Not yet ascertained.

In the year 1872 a greatly increased production of pig-iron is apparent; this was due to the high prices ranging in that and the previous year, the demand for iron being considerably above the average, proving a great incentive to the ironmaster to increase his yield, and had that prosperity continued the production of subsequent years would have been considerable; the financial crisis that followed led, however, to diminished production.

### THE AMERICAN PROTECTIVE TARIFF.

The Americans have done their best to keep British iron and steel out of the American markets by inducing Congress to enforce a protective tariff. But they have not resorted to or relied upon a protective tariff alone; on the contrary, they have done their utmost and done it, too, with success—to develop a vigorous metallurgical industry, irrespective of any legislative patronage or aid. The demand for certain qualities of pig-iron which prevailed a few years since in the United States induced American ironmasters and capitalists to carefully examine American ores, and the result has been that pig-iron said to be equal in quality to English or Scotch pig, can now be furnished to the full extent required, and at moderate prices, or relatively moderate prices. American ironmasters appear to have comprehended the fact that if they hope to retain the protective tariff, of which they are so fond, they must be content to produce at a comparatively cheap rate. A democratic Government may be brought to give its consent to a system of protection to native industry so called, but it will never consent that one branch of native industry should thrive inordinately at the expense of other sections of the community. Such a system might be possible in autocratic Russia, but it could never last long in democratic America. Hence, in spite of the protective tariff established by Congress, the price of iron and steel has been gradually declining in the United States—partly in obedience to the inexorable law of supply and demand, and partly through the natural tendency of the Americans to compete more or less inactively with each other.

The railroad interest of the United States has undoubtedly profited very materially from the rapid development of the manufacture of iron and steel which has taken place in the Great Republic during the last ten years. With the increase which has been gradually but steadily taking place in the weight of locomotives on both sides of the Atlantic—with an increase, too, in the weight of cars, their load, and the speed of trains—the continuance of iron rails became a matter of ever increasing difficulty, especially upon the light, and in the first instance imperfectly constructed railroads of the United States. Steel rails happily came to the rescue; if this had not been the case, American railroad managers would possibly have had to go back to light locomotives, light cars, and slow speeds. Such a retrograde policy as this would, of course, have added rather materially to the cost of transporting men and commodities from point to point, and would by consequence have inflicted a rather serious blow upon the prosperity of the United States.

But, as we have already observed, steel rails came to the rescue of the American railroad interest; and not only have they done so from a mechanical but also from an economic point of view. As the demand for steel rails has increased in the United States, the means of producing them has grown in a still more rapid ratio, and the result has been that their price has been declining year by year. The reduction which has also taken place in the price of both iron and steel rails in both Great Britain and Europe has, of course, exerted some influence upon American markets; still the progress of American production has also powerfully contributed to the downward tendency which has prevailed in quotations. In 1866, 1867, and 1868, steel rails brought about \$100 per ton upon the New York market, and even in 1869 they made \$132 per ton upon the same centre. In 1870, however, they sunk to \$106 per ton, and in 1871 to \$102 per ton. The feverish activity which characterised the American railroad interest in 1872 and 1873 caused a rally in prices in those years, but in 1874 quotations sunk to \$94 per ton, and in 1875 to \$75 per ton.

### JET MINING AND WORKING.

Found generally in the upper lias bed, once along the coast from Whitby to Staithes, and now chiefly in the Cleveland hills, jet has been long worked in Cleveland—so long, but until latterly so quietly, that history records not its early phases. Whitby has long been associated with, first, jet mining, and latterly with jet working; and although newer and more extensive trades have been introduced into that ancient town, jet working is still its staple trade, but mining for the material seems to be removing to a greater distance from the town. The cliffs to the north of Whitby have furnished some of the most valuable finds, and a seam met with some two or three years ago near Codhill was estimated to be of the value of 10000; but of late the chain of hills from Ingleby Greenhow towards Northallerton have been the chief places worked, and at present the inner sides of the hills converging into Bilsdale furnish the bulk of the jet now sent from Cleveland to the chief seat of manufacture. Along the coasting cliffs jet is sought by what is called "dressing," or literally quarrying down the seaward face of the cliff, and some valuable coastside seams have been discovered by the action of the sea, but in the hills tunnelling (much in the manner of the Cleveland iron mines, but in a less systematic mode) is the inevitable way. The stratum in which jet is found lies below the alum rock; it is usually some 20 ft. in thickness, and as old workings of some 6 or 8 yards deep abound, these must be cut past. Generally a drift is run in for about 80 yards nearly level; the shale and earth being run out and tipped down the face of the hill. From the drift cross sections are cut about 150 ft. in length, and in these the miners pull down with pick and shovel the earth retreating before it till each way is thus worked out. The jet is invariably horizontally found, and the miners found, partly on this, a theory that it has at some time been liquid. The mode of working the mines peculiar to the trade—it is neither by royalty on output nor lease of pits, but it is by payment for the right to work from a certain area of foreground—usually 200 yards—to any depth, the number of men being restricted to six on an average for the length of foreground stated. Three years ago in Bilsdale alone there were above 200 jet miners at work there, with a few companies near Guisborough additional. Now, through the decline in the demand, and the importation of Spanish jet, the number is much fewer. The mode of payment of the miners varies; in one or two instances the amount realised by the sale of jet after the payment of ground rent, is equally divided amongst the fine workers and the "jet master" who has furnished the capital; in another the co-operative system has been tried, the men receiving a certain amount of subsistence money and equal shares in half of the net receipts, the remaining half being the master's remuneration; but the bulk of the miners receive a weekly wage, and prefer the system. Hence the risk is generally the jet master's, and though the price of jet has been high—in some cases as much as 16s. per lb. have been paid for choice specimens—yet when it is remembered that the price is a fluctuating one, that the quantities found are usually small, and that they are lessened by the "doggers" found in the seam and the dazed jet—that which

will bear no polish—it will be found to be a hazardous speculation. For the miner, when demand is fair, as tools—save the spade—are found him, as the work is of some eight hours daily, and though laborious, is largely free from accident, the wage paid contrasts most favourably with that for agricultural labour, of which it is the substitute in most of the cases.

Whitby is the almost invariable place of jet "manufacture." The first process is—after the removal of the "scar," dirt, &c.—the sawing of the block into sizes suited to the objects for which it is to be used, and then the rubbing on small grindstones, given rapidly by a treadle, and it then passes into the carving rooms. Here, with small leather-bound chisels, the pattern is cut, foot lathes cutting the holes in flower pieces, &c., and of late the artistic nature of these cuttings and carvings is greatly improved, whilst a further excellence appears to be probable from the associated efforts of many interested in the jet trade. And as a result of this there is a greater fidelity to nature visible in the fruit and flower pieces, an increasing nicety in the shaping of the necklets and coronets, and a greater approach to artistic outline in the shaping of the heads of brooches.

After this cutting the carved goods are polished, which is effected by their being held against rapidly revolving wheels, which are covered with chamois leather, the hollow parts being rubbed with strips of list, the polish being given by lamp-black. Except pricing, packing, and carding, this is the concluding process in the simple one of manufacture. The workmen, it may be added, serve an apprenticeship; piecework is the usual mode of payment, and as jet acquires a largely enhanced price from the work, the rate and wages is tolerably good.

In proof of the last remark, it may be added that though rough jet ranges in price from 2s. to 10s. a pound, the finished work realises often more than six times the latter amount, but there is considerable waste, usable only in the shape of beads, and other very small articles. The value of the jet trade to Whitby has been variously stated; as low as 20,0000, and as high as five times that amount has been stated, and probably now the produce of it will be nearest the latter amount, whilst the number of persons employed in Whitby in the trade is said to be above 1200, or, roughly speaking, a twelfth part of the population.

### NEW CONSOLS SILVER WORKS.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—I have reason to believe your correspondent of last week is correct in saying this concern is working to a profit, and as I have steadily held on to my shares I advise my co-shareholders to do likewise. It has always been understood that when once the difficulties connected with new furnaces and new processes were got over the concern would go ahead rapidly, and I heard in Liskeard last week that if the concern were in local hands it would be looked up to as a prize second only to the celebrated Devon Consols. The opinion seems to be that the shares are unduly depreciated, and that speculative offers of stock on a dull market is the sole cause, but this is certain—no shares are really to be got, and whether 10000 per month profit is being made or not, it is not likely that persons will now sell their shares for a trifle when a few months will double their value. This concern can make 50,00000 a year profit without much trouble, and those shareholders who buy shares at present cheap prices will in a few months double or treble their money. I advise all who are shareholders and interested in manufactures to visit these great works, and see with their own eyes the extraction of the four metals, and then to double their holdings, and on no account to sell a share, and thus play into the hands of "bears," who would only be too glad to get into this concern. S. T. B.

(For remainder of Original Correspondence see this day's Supplement.)

### THE PULSOMETER.

(FROM A CORRESPONDENT.)

It not unfrequently happens that principles which, theoretically considered, appear least likely to prove successful are shown upon practical application to be capable of giving highly satisfactory results, and a striking evidence of this is to be found in the pulsometer, now being introduced as the "best steam-pump in the world" by the PULSOMETER COMPANY, of Queen Victoria-street. The three or four years experience with the pump in America has led to its being referred to as one of the most remarkable strides made in the simplification of machinery during the present century, and the opinion is expressed that within certain well-defined limits it is likely ultimately to lead to the abandonment of the more complicated forms of steam-pumps. The principle applied in the pulsometer was really put into practice 200 years ago, when Thomas Savery attempted to raise water by the direct action of steam upon its surface out of chambers into which it is lifted by atmospheric pressure, the vacuum being formed by the condensation of the waste steam, but owing to some defects in detail the principle was speedily abandoned altogether, and until within the last few years the application of the steam pressure upon a piston, instead of directly upon the liquid to be raised, came to be regarded as a necessity.

The original features which distinguish the Pulsometer from the older engines of the same type are described as being very striking, and essential to its success. The condensation is not effected by the cooling of the vessel, either by an external shower, as in Savery's, or by an internal injection, as in Desaguliers' apparatus, but by the sudden contact of the steam, after it has fulfilled its duty of depressing the water in one of the chambers with the surface of that water, and it is explained that no other cooling takes place than is due to the entrance of the fluid, at whatever temperature it may be desired to pump it. The other original and most ingenious feature is the automatic action of the valve which regulates the flow of steam to each chamber alternately, and thus controls the number of pulsations and the quantity of liquid discharged. Simple as the action of the pulsometer is in its present form, its simplicity has, it is said, been the result of almost innumerable experiments and failures by the patentee, yet it is by a combination so elementary as to be almost absurdly wanting in detail that the present excellent results have been produced.

The Pulsometer consists mainly of a single casting called the body, which is composed of two chambers joined side by side, with tapering necks bent towards each other, and surmounted by another casting called the neck, accurately fitted and bolted to it, in which the two passages terminate in a common steam chamber, wherein a ball valve is so fitted as to be capable of oscillation between seats formed in the junction. Downwards the chambers of the body are connected with the induction passage wherein the inlet valves are arranged. A discharge chamber common to both chambers, and leading to the discharge pipe, is also provided, and this also contains one or two valves, according to the purpose to be fulfilled by the pump. The air-chamber is made in the same casting as the chambers and communicates with the suction. In some instances it is divided by a diaphragm, and one portion communicates with the suction, and the other with the delivery. The induction and discharge chambers are closed by covers accurately fitted to the outlets by planed joints, and readily removed when access to the valves is required. The pump being filled with water is ready for work. Steam being admitted through the steam-pipe passes down that side of the steam neck which is left open to it by the position of the steam ball, and presses upon the small surface of water in the chamber which is exposed to it, depressing it without any agitation, and consequently with but very slight condensation, and driving it through the discharge opening and valve into the rising main. The moment that the level of the water is as low as the orifice which leads to the discharge the steam blows through with a certain amount of violence, and being brought into immediate contact with the water an instantaneous condensation takes place, and a vacuum is, in consequence, so rapidly formed in the just emptied chamber that the steam ball is pulled over into the seat opposite to that which it had occupied during the emptying of the chamber, closing its upper orifice and preventing the further admission of steam, allowing the vacuum to be completed; water rushes in immediately through the suction-pipe, lifting the inlet valve and rapidly re-filling the chamber. Matters are now in exactly the same state in the second chamber.

With regard to the working of the pump in America the company have received a large number of very flattering testimonials, showing that it is largely employed in mines, manufactories, and by railway companies; that it gives general satisfaction, is unshakable, sand, mud, peat, &c., passing without any inconvenience; that there is exceedingly little wear and tear, whilst there is nothing to get out of order, and that very little steam is required to work it—greater recommendations than these can scarcely be desired.

### MINING NOTABILIA.

(EXTRACTS FROM OUR MINING CORRESPONDENCE.)

EAST CARADON.—The statement of accounts for 12 weeks to June 10, presented at the meeting of adventurers held at Salisbury on the 12th inst., showed only a balance of 150. 12s. 8d. in favour of the mine. The agents reported that since the last meeting they had removed the drawing lifts below the 100, at Williams's shaft, and fixed a new plunger-lift at the 130, and resumed the sinking of the shaft; it is now about 4 fms. below this level, and the ground continues hard clay. Child's Lode: The winze in bottom of the 130 has been sunk about 5 fms., but owing to the increase of the water the men had been put to rest and stops the back. The lode in the 130 east, on south part, is 1 ft. wide, chiefly pebble. The ground by side is favourable granite.—Caunter Lode: The 130 east continues large, composed chiefly of capel and mudstone, with a little ore intermixed.

SOUTH WHEAL CROFTY.—Is the manager of this mine in Germany, or where is he? Or are his engagements so numerous that he cannot find time to send a report to the Journal? I have seen no report since the last account, but I am pleased to observe by a local paper there are 168 tons of copper ore for sale next week. It is important, and only reasonable, that the shareholders should know what the progress of operations are between one account to the other. Most agents think it their duty to send a report to the Journal before one account to the other. Considering the prospects of this mine it is important that the fullest information should be given through the Journal; many of us know that these shares have been as high as 1200, and now only 160 to 170.—A SHAREHOLDER.

LLANRWST.—This company is expected to be one of the most successful mining enterprises opened out and discovered within the last few years. The lodes are numerous, and all of them are prolific in rich lead ore, varying from 1 to 5 tons of lead per fathom. Thousands of tons of lead ore are said to be on the surface, besides about 27,0000 worth of lead opened upon and discovered below, waiting the completion of the machinery and the dressing floors, for the purpose of preparing the lead and sending it to market, when it is expected that large sales of it will take place and be continued, and to provide for dividends.

MACHINE PUDDLING IN STAFFORDSHIRE.—What promises to be an admirable furnace to aid in the mechanical production of iron has just been started at the Round Oak Works by Mr. Smith-Casson, manager for that portion of the Earl of Dudley's property. It is a Casson-Dormoy furnace, to which Mr. Casson has attached a gas-making apparatus. The apparatus is not wholly unlike that connected with the Bicheroux furnace, which is likewise in operation at the same works, but it has points of superiority which make it more serviceable and effective. Coal is admitted to the furnace through a hopper, and is drawn down to a slanting grate. From the hollow casing of the chimney stack hot air is pulled down, and is driven into the gas furnace from the front of the grate. At the same time hot air passes round the top and the bottom of the furnace, and meets and fires the gas as it escapes over the bridge into the puddling-furnace. The gas after doing its work in the furnace passes into the heating chamber between the furnace and the stack, and after having there heated the pig-iron about to feed the puddling-furnace, is utilised in the heating of a steam boiler erected along the top of the furnace. The gas seems to be well at the disposal of the puddler, and evidently supplies both a fierce and a pure flame. The furnace has just been started for the first time, and on the first day in six turns it produced 3 tons 16 cwt., and on the following day about the same quantity of iron. It is estimated that three Casson-Dormoy furnaces, working six heats with, when fired with coal, produce 90 tons of iron per week, but that, fired with gas in the manner described, 120 tons in a week may be got out of the same plant. The rabbits are worked upon a principle invented by the engineer of the Round Oak Works, which is an improvement upon Griffith's method. This gas and blast apparatus of Mr. Smith-Casson promises, when attached to a Casson-Dormoy furnace, to produce puddled iron with almost the minimum amount of labour for such machinery.—Birmingham Daily Post.

### IN VOLUNTARY LIQUIDATION UNDER THE COMPANIES ACT, 1862. THE NEW LLANGYNOG LEAD MINING COMPANY (LIMITED).

TO BE SOLD, BY PRIVATE TREATY, ALL the BENEFICIAL INTEREST of the New Llangynog Lead Mining Company (Limited) in the LLANGYNOG LEAD MINES, comprising all the valuable, productive, and extensive mines, veins, beds of lead, ore of lead, and other metals and minerals known collectively as the Llangynog Lead Mines, and in the reservoir, water-supply rights, easements, and interests thereto belonging, situate in the several parishes of Llangynog, Llanrhaadr-y-n-Mochnant, Hirnant, and Pennant, in the county of Montgomery; and also the WHOLE of the movable PLANT and MACHINERY of the said company.

The Llangynog Lead Mines have been a highly productive and dividend-paying property.

The mines, machinery, and plant are in working order, and considerable quantities of ore are now being raised. The works may be inspected at any time upon application to the Manager at the Mines. The leases and agreements may be inspected at the offices of Messrs. LONGUEVILLE, JONES, and WILLIAMS.

All further information may be obtained, and maps of the property inspected on application to Messrs. GEO. HASWELL and SONS, 54, Foregate-street, Chester to HENRY DENNIS, Esq., Mining Engineer, Hafod-y-Bwch, Ruabon; or to Messrs. LONGUEVILLE, JONES, and WILLIAMS, Solicitors, Oswestry.

NICKEL AND COBALT REFINING, AND GERMAN SILVER WORKS, 16, OZZELL STREET NORTH, BIRMINGHAM.

STEPHEN BARKER begs to inform the Trade that he has the following articles for sale:—REFINED METALLIC NICKEL.

REFINED METALLIC BISMUTH.

OXIDE OF COBALT.

GERMAN SILVER—IN INGOTS, SHEET, WIRE, &c.

NICKEL AND COBALT ORES PURCHASED.

GOLDENHILL COBALT, NICKEL, COLOUR, BORAX, AND CHEMICAL WORKS.

NEAR STOKE-UPON-TRENT, STAFFORDSHIRE.

JOHN HENSHALL WILLIAMSON, MANUFACTURER AND REFINER.

Purchaser of Borate of Lime and Tincol.

### LOCOMOTIVE TANK ENGINES.

FOR MAIN LINE TRAFFIC, SHORT LINES, COLLIERIES.

CONTRACTORS, IRONWORKS, MANUFACTURERS, &c., from a superior specification, equal to their first-class Railway Engines, and special adapted sharp curves and heavy gradients, may always be had at a short notice from—

MESSRS. BLACK, HAWTHORN, AND CO.,

LOCOMOTIVE, MARINE, AND STATIONARY ENGINE WORKS,

WILTON'S MATHEMATICAL INSTRUMENT ESTABLISHMENT,

REMOVED from St. Day to A. JEFFERY'S, CAMBORNE.

W. H. WILTON begs to thank his friends for their liberal support for so many years, and informs them that (having opened business at Valturais) he has now declined business in England in favour solely of Mr. A. JEFFERY, MATHEMATICAL INSTRUMENT MAKER, CAMBORNE, whom he considers (having been an assistant to his father for several years) is in every way capable of creditably maintaining the good name universally awarded to Wilton's instruments.

A. JEFFERY

Respectfully begs to inform Mine Managers, Surveyors, Engineers, &c., the having purchased Mr. Wilton's business, and the very valuable acquisitions and appliances belonging thereto, he has enlarged his Mathematical Instrument Manufactory, and is prepared to supply THEODOLITES, DIAPHS, POCKET DIAPHS, LEVELS, TRAVELLING AND PLAIN PROTRACTORS, CASES OF DRAWING INSTRUMENTS, MEASURING CHAINS AND TAPES, ASSAYER'S SCALES AND WEIGHTS, ENGINE COUNTERS, and, in short, every description of Instruments used in SURVEYING, MEASURING, MAPPING, &c.

Repairing in all its branches promptly attended to.

STRONG WIREWORK.

STRONG WIREWORK, the cross wires equally bent; also BEST

STAMP GRATES, both of iron and copper, and punched copper plates.

DITTO TUBBED. All the above promptly supplied at

W. ESCOTT'S MINING MATERIAL DEPOT,

TAVISTOCK, DEVON.

FOREIGN ORDERS PROMPTLY EXECUTED.

M. R. J. S. M. E. R. R. Y.

ASSAYER AND ANALYTICAL CHEMIST,

SWANSEA.

M. R. P. E. R. C. Y. R. O. B. E. R. T. S.

FINANCIAL AGENT,

10, ENGLISH STREET, CARLISLE.



## Registration of New Companies.

The following joint-stock companies have been duly registered:—

**SHEFFIELD COAL COMPANY (Limited).**—Capital 90,000*l.* in 450 shares of 200*l.* To acquire the business of coalmasters and merchants hitherto carried on by the firm of J. Crook, Dunn, and Co., or the Sheffield Coal Company. The subscribers are—T. W. Jeffcock, Sheffield, mining engineer, 75; Deane Mann, Dunmoyls Lodge, near Omagh, Ireland, 75; Henry Hornecastle, Whitmore, near Alton, land agent, 10; Edward Wake, Abbeyfield, near Sheffield, solicitor, 10; W. Dunne Gainsford, Richmond Hill, Yorkshire, coalmaster, 49; Charles Warner, Cleve, near Grimsby, clerk in holy orders, 1; T. R. Gainsford, Whitely Wood Hall, near Sheffield, coalmaster, 49; C. G. Vickers, Sheffield, solicitor, 1. The subscribers will be the directors, and Messrs. W. D. Gainsford and T. R. Gainsford will be managing directors, at a salary of 750*l.* per annum each. The whole of the shares are taken up.

**JEFFRESON ANTHRACITE COAL COMPANY (Limited).**—Capital 25,000*l.* in 125 shares. To acquire collieries in the parish of Jefferston, and elsewhere in the county of Pembroke. The subscribers are—Thomas Stokes, Narbeth, gentleman, 500; Alexander Waters, Belyell, engineer, 50; John Waters, Belyell, engineer, 50; Charles Clifton Hood, 122, Cannon-street, gentleman, 10; Spencer William-Hunter, Gloucester, merchant, 1; W. Howell, Lewis, Narbeth, bank manager, 5; C. Allen, Tenby, gentleman, 500. This company is registered without articles.

**ORIENTAL AMERICAN TELEGRAM COMPANY (Limited).**—Capital 25,000*l.* in 50 shares. To take over the business of Mr. R. W. O. Roche, telegraph agent, &c. The subscribers are—Charles Williams, 110, Cannon-street, 5; Joseph Daniels, 75, Brewer-street, Woolwich, 5; R. W. O. Roche, 140, Leadenhall-street, 5; A. W. Batheeler, 9, Newstead-road, Lee, 5; Daniels, Molewstone-street, Lewisham, 5; M. L. F. Kutme, Glaskin-road, Hackney, 5; Rebbeus, Walington, 1.

**TROJES MINING AND SMOELTING COMPANY (Limited).**—Capital 80,000*l.* in 400 ordinary and 165 deferred shares of 100*l.* each. To acquire and work the mines of Anguineo, the smelting works of Trojes and Santa Barbara, and the land of Rio-Rio, State of Michoacan, Mexico, according to an agreement made between R. B. Symons and Don Pio Benjumea. The subscribers are—J. W. B. Clay, M.P., Aberdeen, 20; John S. Sellow, 75, Hatton Garden, assayer, 30; Ferdinand Wren, 1, Coleman-street Buildings, merchant, 20; J. de Mancho, 116, Gresham House, merchant, 15; A. Jacob, 61, Moorgate-street, wool broker, 2; B. Ince, 22, Great Winchester-street, merchant, 20; F. J. Isaac, 23, Great Winchester-street, merchant, 10. The directors are not yet appointed, but the qualification is fixed at 10 shares.

**MARINE PALACE, LIVERPOOL (Limited).**—Capital 100,000*l.* in 50 shares. To construct a winter garden and place of entertainment at New Brighton. The subscribers (who take one share each) are—John Makin, 69, West Derby-street, Liverpool; Charles Goodley, 4, Westminster Chambers; W. Sheppard, 25, Moor-gate-street, 2; D. Garton, 61, Keltell-street, Brixton; James Bais, jun., Silverdale, Surbiton; H. A. Sarl, 34, Highgate-road; J. T. Heath, The Chesnuts, Willesden Green.

**GREAT GRIMSBY AND CLETHORPE TRAMWAY COMPANY (Limited).**—Capital 40,000*l.* in 20 shares. To construct a tramway between Grimsby and Clethorpe, Lincoln. The subscribers are—James N. Jones, Field House, Great Yarmouth; J. Sawyer, Great Yarmouth, 1; August Thore, 12, Fitzroy-street, Fitzroy-square, 1; Victor Cousin, 1, Titchbourne-street; Alexander McPherson, Great Yarmouth, 10; W. Trangan, 63, Prince's-terrace, Regent's Park, 1; E. Gardie, 11, Archer-street, Great Windmill-street, 1.

**LICENSED VICTUALERS TEA ASSOCIATION (Limited).**—Capital 20,000*l.* in 10 shares. To acquire the business of the Licensed Victuallers Tea Association. The subscribers are—E. Kynaston, 24, Mining-lane, 3000; C. F. Kemp, 8, Walbrook, 20; Harold Brown, 7, Albion, 5; E. J. Gardner, 55, Lea-terrace, Blackheath, 10; W. F. Wark, 134, Finchurch-street; Robert Sutherland, 14, Church-street, 10; W. S. Foster, 39, Kensington-road.

**TRIGGERLESS RIFLE AND FIRE ARMS COMPANY (Limited).**—Capital 25,000*l.* in 10 shares. To acquire the patent rights of Mr. John Dunstan for the manufacture and sale of triggerless rifles, &c. The subscribers are—P. J. Bishop, Cavendish-road, Clapham, 20; G. Todd, East Hill Lodge, Wandsworth, 5; G. J. Penches, 6, Manse-terrace, Stoke Newington, 5; E. J. Cowton, 7, Stanley-terrace; N. D. Hutchinson, 29, Lamb's Conduit-street; John Simpson, 2, Great James-street, Bedford-square, 5.

**MODE WHEEL MILLS COMPANY (Limited).**—Capital 60,000*l.* in 100 shares. To carry on business as corn and logwood merchants. The subscribers are—Robert Whitworth, 11, Cross-street, Manchester, 500; Alfred Whitworth, 11, Cross-street, Manchester, 100; Thos. Whitworth, 11, Cross-street, Manchester, 100; J. Walker, 15, Cannon-street, Manchester, 20; F. Moss, Didsbury, Lancashire, 20; John Greenwood, Eccles, 500.

**THOMAS SIMPSON AND COMPANY (Limited).**—Capital 25,000*l.* in 100 shares. To acquire a bone and manure business at Sleaford, Lincolnshire.

## ECHOES FROM THE MINING MARKET.

We are able to record a much better feeling in mining affairs. The metal markets are stronger, whilst on the part of the public there appears to be a greatly increased disposition to buy into all good marketable stock. The cheap and low-priced lead shares were referred to a short time since have been in demand at higher prices, and this has been particularly noticeable in Glyn, Great West Van (a good improvement has taken place here), North Laxey, Rookhope, and several others. Coal is slightly lower, but iron shows no change for the worse. Matters in the North appear inclined to improve; indeed, there are not wanting symptoms of a general improvement in trade throughout the country. Investors should not lose sight of the present opportunity, as when the market turns there will be a great rush to buy, prices in nearly all cases being still exceedingly low, and there being, far beneath what the real merits of the different mines warrant.

We have just heard of an improvement at the Levell Mine. For some little time past we have noticed the good points they have had, and last week the various shares were valued in the aggregate at 70*l.* per fathom. For the past two months they have been driving through a hard lot of granite in the 30 and east, but now the level is clear of it, and the level has opened out 6 ft. wide, worth 15*l.* per fathom, with every appearance of becoming a large and rich lode.

Owing to a visit to the North our remarks this week are somewhat curtailed, but in our next we hope to review in detail the various departments of the market.

JAMES H. CROFTS.

## THE WEEK.

**MONDAY, JULY 24.**—A curious feature of the day was the demand for Sheffield, buyers being apparently enamoured of the forthcoming dividend of 1/4 per cent. The rise altogether was one of 1/4 to 3/4. Caledonian, Metropolitan, and North British found buyers, and improved 1/4. Dover A in the morning were dealt in at 118 1/2, but late in the afternoon, when the traffic returned showed a decrease of 182*l.*, there was a relapse to 117 1/2. The Brighton traffic showed an increase of 335*l.* In mines, East Van fell to 8 1/2, a change for the worst, equal to 1*l.* per share. Great Laxey, 17 to 18 (ex div.); West Tankerville, 14 to 15; Wye Valley offered at 3 1/2. Elsewhere—8 1/2 to 8 3/4. Direct Cable, 8 to 8 1/2; Hooper, 1 to 1 1/2; West India, 5 1/2 to 6. There was a total absence of business in the foreign market, what little was done consisted mainly of sales. Russian and Hungarian gave way about 1 per cent. all round. Mexican (old) rose 1/4.

**TUESDAY.**—Early in the morning (buying orders of British) were received from Glasgow, and after being dealt in at 9 1/2, the stock closed 9 3/4 to 9 3/8, a rise of 1/4. Caledonian advanced on the day 1/4. Great Eastern 1/4. Metropolitan District 1/4, and Sheffield 1/4. Against this rise a fall of 1/4 in Berwick, and one of 1/4 in Dover A must be noted. Eries, 12 1/2 to 12 3/4; Atlantic First, 22 1/2 to 23 1/2; ditto Third, 4 to 4 1/2, with very little doing. In the miscellaneous market Australian Agricultural rose 2 to 90*l.* Lion Brewery quoted 24 1/2 to 25; Argentine, 44 to 45; Giano, 3 1/2 to 3 3/4; General Credit, 6 1/2 to 6 3/4; Eley Brothers, 22 to 23; 4 to 4 1/2; and Russian (1875), 85 1/2 to 86 1/2. East Van fell 1/4, to 7 1/2; Glyn quoted 3 1/2 to 4. The settlement commences in the morning.

**WEDNESDAY (continuation day).**—Stock was much more plentiful than last time, in only two or three instances was there a backwardation, which in the afternoon went lighter, or this contingencies increased. A large "bull" account in Caledonian was dissolved, the rate was 10 1/2. British were even, so were Brighton. Brighton A, was carried over at 105 1/2, but at the close the price was as high as 107 1/2. Eastern and Chatham Preference rose 1/4. The dividend of the latter was announced in the afternoon as 1*l.* 10s. per cent., against 1 1/2 last year. The Metropolitan District dividend will be 4 per cent. on the preference stock. The distribution last year was at the rate of 2 1/2 per cent. The Berwick dividend now due failed to arrive, the stock was violently agitated during the day, oscillating between 155 and 157; the return. The best increases were—Midland, 6 1/2 to 7; Great Eastern, 3 1/2 to 4; and North Western, 2 1/2 to 3.

**THURSDAY.**—Some of the changes in railways to day were little short of marvellous. Yesterday Great Western were continued at 105, and "bills" were made to pay 5 1/2 shillings, the stock thus appearing at surface to be over plentiful. To-day, however, showed it to be quite otherwise. Almost at opening a few large purchases sent the price up to 107 1/2, and when 108 had been reached there was a feeling of *en quai puet* among the "bears." They were thoroughly caught, some in their bewilderment closing at 111, but the top price was really 110 1/2 to 110 3/4. Those who were "bears" yesterday of York A, at 133 took the hint, but did not get much stock under 135 and 136. North British rose 1/4 to 107 1/2. Midland rose to 131, and Berwick recovered lost ground to the extent of closing at 157. Nothing was known during hours as to the dividend of this company. On it great issues now depend, gathering in intensity each hour as it is delayed. Brightons were almost unchanged, and showed signs of weakness in the morning. Sheffield was quite neglected.

**FRIDAY.**—The Berwick dividend proved to be one of 7 per cent., against 8 1/2 time last year; 7 1/2 was expected in some quarters, but on the whole it gives satisfaction, and the stock has risen to 153 1/2. Great Western are still, at a fall of 1/4 per cent. owing to yesterday's accident to the express. Brighton and Sheffield are now quoted ex div., and the respective prices are 118 1/2 to 119 1/2 and 119 to 120. British, 97 1/2 to 98 1/2; Midland, 130 1/2 to 131 1/2; Birmingham, 14 1/2 to 14 3/4. Two o'clock.—Prices have improved, Great Western being 110 1/2 to 111 1/2; Caledonian, 12 1/2 to 12 3/4; and Sheffield, 7 1/2 to 8. Midland has advanced to 131 1/2, and Birmingham to 157 1/2. Dover A, has been dull, at 118 1/2, and Berwick at 158; but the former are now 116 1/2, and the latter 155 1/2. Four o'clock.—Beyond an advance in Brighton to 120 1/2, and a rise of 10s. in Dover A, prices are rather easier. British are 157 1/2 to 157 3/4. Brighton A, 107 to 107 1/2. The settlement was concluded this afternoon, but not without two failures—both young men.

Birmingham, July 28.

FERDINAND R. KIRK.

**EXCHEQUER (Gold and Silver).**—The Furnace: Bricks are being hauled to the site for the O'Hara furnace to be erected at the Exchequer mill. It is expected that the furnace will be getting out bullion on or before Sept. 1. It is a consolation to know that this is not another Alpine experiment. The success of this style of furnace at Reavine has dispelled all doubts as to its ability to work our ores.—*Alpine Chronicle*, July 1.

## Mining Correspondence.

## BRITISH MINES.

**ASHETON AND WEST ASHETON.**—John Craze, July 27: The boundary shaft is now down 2 1/2 fms. below the 70; set to nine men, at 12 1/2 fms. per fathom, to cut the lode. The 70 cross-cut is now extended about 7 fms. south; set to two men, at 7 1/2 fms. per fathom; the object of this cross-cut is to intersect the south, or main lode, which we calculate to accomplish in about 10 or 12 fms. further driving. The 60 west is set to four men, at 3 1/2 fms. per fathom; the lode here is 3 ft. wide, of a very promising character. The 60 east is now in 10 fms., and is set to four men, at 3 1/2 fms. per fathom; the lode here is from 2 1/2 to 3 ft. wide, producing good stones of lead and blende, and from its present appearance an early improvement may be expected.—Asheton Proper: We have set one stop in the 40 east, to four men, at 2 1/2 fms. per fathom, are preparing to open two more in back of this level, which have set the following tribute pitches:—Two men in back of the 40 east of Brown's, at 6*l.* per ton. Two men in back of the 40 west of Mawr, at 7*l.* per ton. Two men in back of the 30 east of Brown's, at 7*l.* per ton. Two men in back of the 30 west of Mawr, at 6*l.* per ton. Two men in back of the 8 east of Mawr, at 5*l.* 10s. per ton. Two men in bottom of the 8 east of Mawr, at 8*l.* 10s. per ton. Two men in bottom of the 5 east of Mawr, at 8*l.* per ton. Two men in bottom of the adit, on north and south lode, south of Lindow's shaft, at 7*l.* per ton. We are preparing for another parcel of lead as early as possible. The pitwork and machinery are in good order, and working well.

**BEDFORD UNITED.**—R. Goldsmith, W. Phillips, July 27: There is no change to notice since the report given at the general meeting.

**CALDECK FILL.**—J. Polglase, July 22: We are making good progress in driving west, on Silver Gill lode; the lode is improving in size and appearance, producing good-looking spar, barytes, carbonate of copper, and stones of lead occasionally. I consider this end a point of considerable interest. The stopes in back of the 80 are looking rather better. In prospecting on the back of the lode at Carrock eastward we were compelled to discontinue sinking on account of water.

**CATHEDRAL.**—Mitchell, July 24: I am glad to see the lode in the engine-shaft, which is 3 ft. wide, is again improving, producing good stones of ore; also the lode on the north side of the lode is softer and more congenial. Having lifted the winze from the 30 to the 42 east of shaft, we shall now resume driving the 42 east end, where the lode is 2 ft. wide, composed of soft gossan, with stones of green carbonate. We shall also begin to stop the lode between the winze and the shaft. The lode in the rise in the back of the 42 west of shaft is squeezed a little, which accounts for the water not being drained in the winze just over. I hope, however, in very short time the lode will open again, and as we have a large porous lode in the bottom of the winze, we may reasonably expect to cut down the water. We shall then sink and rise and communicate as fast as possible.

**CWM LWFYFOR (Copper and Silver-lead).**—J. Jewell, July 27: Setting Report: Stewart's Shaft: The present depth of this shaft below the 10 is 8 fms. 1 ft. 6 in.; the lode in the bottom is thrown north by the head of clay slate referred to in my last report; we have not as yet sunk deep enough in the clay slate to form an accurate opinion as to its effect on the lode, but we shall not doubt be able to sink and rise, and the ground looks well for lead. We shall in another two months, or less, I hope, be deep enough to commence driving levels east and west at the 20, by which we shall get 10 fms. backs for stopping.—No. 4 Level South: I have removed the men from the end east of Stewart's shaft, and have put them to drive on the counter branch west of the shaft, where the lode yields 10 cwt. of lead ore per fathom; price for driving 10*l.* 10s. per fathom.—No. 3 Level South: The lode in this level, driving east of the south cross cut, is all the size of the end, producing a little mineral; price for driving 14*l.* per fathom. I have sent you some stones of ore broken from the bottom of Stewart's shaft.

**CWMYSTYLL.**—July 26: We have holed the winze in the bottom of the Ross level with the rise in the back of Mitchell's level, but it will take us this week to square the ground, and shall be able to give you particulars as to the value of the lode left standing in the side of the winze in our next report. In Mitchell's level west, on the new lode, the lode is still 3 ft. wide, producing saving work. In Gill's upper level cross-cut north the ground continues hard for driving. In the stopes and pitches in level Fawr, on the copper lode, no alteration has taken place. We have all the castings, &c., for the air-compressor on the mine, and commenced putting up the pipes. The carpenters are getting on well with the ladders, and we hope to get the water-wheel on the mine next week. Our Colliery's patent ore-washing machines are working well, and getting through a large quantity of stuff; although the halvans are poor, at the same time they will pay well for dressing.

**DE BROKE.**—J. Phillips, July 28: A portion of the ore bearing part of the lode, producing about 1 ton per fathom of lead ore, has been cut in the 35 cross cut. The winze sinking below the 21 will produce 2 tons lead ore per fathom. The stopes east and west of rise will produce 10 to 12 tons per fathom. The stopes in the north side of the lode are looking better, and we are getting some splendid stuff for the floor. Dressing Floor: Good progress is being made here, and we shall to-morrow sell for cash 5 tons of lead ore, price 13*l.* per ton.

**DEVON GREAT CONSOLS.**—Jas. Richards, July 28: Wheel Anna Maria: Engine-shaft: The ground in Jeffrey's cross cut south at the 80 is favourable for exploring, and water continues to flow, an indication of more lode standing in this direction.—Wheel Joshua: Richards's Engine-shaft: The cutting of plat and barrow-road at the 280 still progresses satisfactorily. In the 60 east, east of Barrow's cross cut, on the south part of the lode, the lode is 3 ft. wide, and worth 10*l.* 10s. per fathom. In the 60 west, and west of Castle's cross cut, on the south part of the lode, the lode is 3 ft. wide, and worth 2 tons of ore, or 6*l.* per fathom.—Hitching's Engine-shaft: In the 144 east, and west of Drew's cross cut, on the south lode, the lode is 3 1/2 ft. wide, and worth 2 tons of ore, or 6*l.* per fathom; this drive is suspended for the time, and the men are put to open the back of the new south lode at surface to the west of Wheel Anna Maria engine-shaft during the fine weather.—Inclined Shaft: In Alfred's cross cut south, at the 160 west, the ground is tolerably favourable for progress. A small branch has recently been passed through, continuing into the 190, between the two parts of the lode, fair progress continues to be made.—New Shaft, New South Lode: In the 160 east 4 ft. of the lode is still being carried, which proves to be a good course of ore, worth 10 tons, or 40*l.* per fathom. The lode in the 145 east is large, 4 ft. of which being carried is still a good course of ore, worth 10 tons, or 40*l.* per fathom. In the 115 east the lode is still 4 ft. wide, and worth 10 tons, or 40*l.* per fathom.

**DUBBY SYKE.**—W. Tallantire, July 21: Dubby Syke Level: We have reached the north and south vein this week, and find the level is driven beyond it; no good appears, and the vein is not so rich as the level above, east, as it is quite barren in the limestone above, and probably one of the rich Green Harth north and south veins.—Shooting Box Level: As we drive from the rise into the vein it improves greatly in character, it is composed of soft ferruginous mineral with frequent pieces of lead ore intermixed. I see no reason why we may not have a course of good ore ground before us here. The vein looks well for turning out very good results.

**EAST BASSET.**—Richard Pryor, Edward Adams, July 25: The lode in the 4, east of Barrow shaft, is 3 ft. wide, far carried, and worth 3*l.* per fathom, with a good appearance, and from present indications we think we are over a fine bed of copper ore; this end is set to six men, at 6*l.* per fathom. The lode in the stopes in bottom of this level (the 40), and 16 fms. behind the present end, is 2 ft. wide, and worth 6*l.* per fathom; stoping by four men, at 3*l.* per fathom.

**EAST VAN.**—W. Williams, July 25: Tempest Shaft is down 30 fms. 2 ft. The lead still holds good in opening the lode east of A cross cut; worth about 30*l.* per cubic fathom. We have had a change to-day in the end of the 25 fms. level west, cutting nice stones of ore, and likely to improve. I will let you know more about it in a day or two. This point, I will bear in mind, and about 25 fms. west of the 25 fms. level, I have had two men working on the lode, but as the weather changes, so as to afford us water to work the blast for ventilation, I shall be able to put more men on.

**GAWTON COPPER.**—G. Rowe, G. Rowe, jun., July 22: The lode in the 127 east is over 6 ft. wide, showing a very kindly appearance, being principally composed of spar, mangle, and ore to the value of 20*l.* per fathom. The lode in the stopes in the back of the 117 is worth 8*l.* per fathom. The lode in the 105 east is producing good stones of ore, intermixed with arsenical mangle. The lode rising going to the back of the 105 is worth 12*l.* per fathom. The lode in the 95 east of the same level is worth 6*l.* per fathom. The lode in the stopes in the back of the 95 is worth 8*l.* per fathom. The lode in the winze sinking below the 95 is worth 7*l.* per fathom. The lode in the 82 east is yielding very strong mangle, with good stones of ore. The stopes in the back of this level is discontinued. The tribute department is without change. We are busy engaged in preparing for our next sampling of ore, which we calculate on the floors to be 170 tons.

**GLASGOW CARADON CONSOLS.**—W. Taylor, W. J. Taylor, July 25: The 75 east, on south lode, is worth 12*l.* per fathom; we have holed this end to the winze from the midway level, making a good vein. We have a good ground to square down to make the level down to the east end of winze, where there is a more valuable lode. The 75 west, on south branch, is worth 7*l.* per fathom.—Middle Level East: In this end we have a good lode, worth 2*l.* per fathom. We have commenced another winze in the bottom of this level to come down some 15 fathoms ahead of the 75 east; at present worth 15*l.* per fathom, and likely to improve. No change in the 65 east, or in the drivings on Harvey's north lode. The 62 east, on caunter, is showing a little better appearance, with spots of copper and mangle, but the ground is still hard. The stopes and pitches throughout the mine are looking well, and in value, from 12*l.* to 25*l.* per fathom. A new shaft is now opened through to the 75, and the cutting it down to that level is in a very forward state. At the same time we are cutting place for angle bolt at the bottom of the downright preparatory to fixing the rods, &c., below. We shall give the computed quantity of ore for August sale next week, which will be about 250 tons.

**GLYN.**—James Roach, July 24: The ground in the 28 cross-cut north, from engine-shaft, is still hard for driving, but very congenial to the production of lead. In the winze sinking under the 15 east the course of ore is continuous. The winze under the 15 west has passed the hard ground and penetrated the clay slate, in which lead has made its appearance. The rise above the 15 east contains a good lode of lead, which will be taken away by stoping.

**GOUGHAN AND LEVEL NEWYDD.**—July 25: In the 120 west of cross cut, from Bryn Pios shaft, the lode is 4 ft. wide, containing a little lead and blende ore, but not sufficient to value; ground favourable for exploring. The 120 east, of western shaft, is going forward in a large lode, and the part carried dismembered throughout with lead ore, producing 1 ton per fathom, and from indications is likely to improve. The 120 west of western shaft, is being pushed forward on the south part of the lode, which is strong, hard, and sparry, containing some good bunches of lead ore, worth 15 cwt. per fm. In winze below the 110, 8 fms. west of Bryn Pios shaft, the lode is 6 ft. wide, and will produce 16 cwt. of lead ore per fathom. The lode in the winze sinking below the same level, 35 fms. west of Bryn Pios shaft, is producing some good ore at times, and there is more lode standing to the south, which will be cut through when the winze is deep enough for the 120.

We have commenced preparations for outfitting, putting in timber, &c., at the 120. We shall resume the sinking of the western shaft as soon as we possibly can. The tribute department without any change of moment, yielding from 14 cwt. to 15 cwt. of ore per fathom. We manage to keep the machinery and all surface

work going regularly, but the weather is so very hot and dry that our water supply will be exhausted again in about a week unless we get some rain. The price of ore was sold yesterday realised 16*l.* 3s. 6d. per ton.

**GORSELD AND MELLYN CONSOLS.**—Wm. Edwards, July 27: The new shaft sinking is progressing as favourably as we could wish. We have a full complement of men continually sinking. We shall sell a small parcel of ore from the quarry this day.

**GREAT DYLLIFFE.**—Edward Rogers, July 26: There has been nothing new of any of the different points of operation during the past week. We are sinking 30 tons of lead ore to-day for sale on August 2; we cannot make any more material until we get some rain. A report shall be sent you in time for the meeting on Monday, the 31st inst.

**GREAT LAXEY.**—F. Reddcliffe, July 25: Deep Mine: The 30 and mentioned in last report as not being quite so good as before has again more than recovered its former value, being at present worth 120*l.* per fathom. The stopes in back of this level is worth 70*l.* per fathom. The 190 end has not yet been resumed, and there is but a short distance between it and the 200, coming south of Dunmoyls, and is thought to be scarcely necessary to do so. The lode in the winze in the back of the 190 is opening out again—present value, 50*l.* per fathom. No. 2 stopes in back of this level is worth 6*l.* per fathom. No. 3 stopes 30*l.* per fathom. The stopes in back of the 165 is worth 36*l.* per fathom. The stopes in sole of the 145 is improved, present value 60*l.* per fathom. No. 1 stopes in roof is becoming more promising, present value 20*l.* per fathom. No. 2 is worked to poor ground, and is suspended, present value 20*l.* per fathom. The 200 still maintains its value of about 40*l.* per fathom. The end of the same level north is worth 18*l.* per fathom at present. No. 1 stopes in the sole of the 170 north is improved, now worth 60*l.* per fathom. No. 2 stopes in the sole of the 170 north is improved, now worth 60*l.* per fathom. No. 3 stopes in the sole of the 170 north is improved, now worth 60*l.* per fathom. The lode in the 140 south is divided into two parts, and one of the branches only is carried at present, which is worth 35*l.* per fathom. The good run again shortly. There are no other changes to notice throughout the mine underground. At surface everything goes on well, except that we suffer slightly from scarcity of water. There is, however, now a little rain, and a prospect of more.

**GREAT TALLACK.**—J. Harris, July 22: The men have cleared out the 20 west, which is extended about 8 fms. west from the shaft. The lode is 4 ft. wide, in hard ground, but contains stones of blende. I have to-day set the end to drive by two men, at 5*l.* per fathom the month. I have also set six pitches, to 15 men, at the 20, 30, and 40 at 35*l.* per ton; if best blende the tributors to pay all cost of hauling, carting, and dressing as hitherto.

**GREEN HURTH.**—Wm. Vipond, July 21: We have got up about 5 ft. in the vein in the rise at the end of No. 1 cross vein; we have more strength of vein, we get more into the limestone, but not so much as we expected. We are saving work in the sinking below adit from some branches that we have cut off. The 140 east, in four men at this and two working at it from the level below. One of the tributaries west of vein is improved, worth at present 3 tons of ore per fathom, and setting up in the roof still better. We have not been working the other branch, and setting being off haymaking. The stopes above adit is worth 16 cwt. of ore per fathom, and the 200 vein continues to yield samples of ore, but not of much value. The stopes behind is worth about 1/2 ton of ore per fathom.—Scales Work: We are getting on with the reservoir, and putting the road into a better state. The weather is very favourable for outdoor work just now. On Saturday, I may say the mine is looking altogether better than it has done for some months.

**HALKYN DEEP LEVEL.**—July 25: The tribute pitch below the 171 west level, to the east of junction, on Pant-y-go vein, is in a lode about 171 west, composed of spar, blende, and lead ore, 14 cwt. of lead ore per fathom, and promising lode, and which, no doubt, will further improve as the workings are extended eastward; the men will earn pretty good wages in this pitch this month. The pitch below the 174 north, east of junction, on Deep Level vein, is in a lode 3 ft. wide, worth 10 cwt. of lead ore per fathom. This pitch is worked down 28 fms. below the 174 north level. There are 28 fms. below the 174 north level, and the Deep Level, &c. We are pushing on to get all the ore out.

**HARWOOD.**—W. Tallantire, July 21: Herdship Level: We have crossed west vein, or branch, at the end of the level. It is only weak, and I expect we wear very close upon another north and south vein in this level. The vein we are working is much improved in appearance this week both in the north and south workings, and each contains more ore.

**HINGTON DOWN CONSOLS.**—James Richards, July 27: Bailey's Shaft: In the 160 west the lode is 4 ft. wide, and is improved, being composed of conglomerate, quartz, peach, mangle, prun, and copper ore, worth 3 tons, or 12*l.* per fathom. The lode in Rowe's winze, sinking below the 150 west, is worth 15 cwt. of lead ore, or 10*l.* per fathom. In the stopes in the bottom of the 150 west, and west of Rowe's winze, the lode is 4 tons of ore, or 12*l.* per fathom. In the three stopes in the bottom of the 150 west, east and west of Nicol's winze, the lode is worth on an average 7 tons of ore, or 30*l.* per fathom. The lode in the two stopes in the back of the 150 fms. west is worth on an average 5 tons, or 20*l.* per fathom. In the 140 west the cross-vein is intersected and cut into the side of the lode, and the lode is broken, indicating a more productive lode in the west thereof. There is no other alteration in any part of the mine.

**KINGTON CONSOLS.**—G. F. Richards, July 27: Fair prospect continues to be made in sinking the engine-shaft, now down about 3 1/2 fms. below the 30. The lode (south part) is of a very congenial character, and produces saving work of lead and blende ores. The 30 west is progressing very favourably: advanced beyond No. 1 winze 3 fms., and the lode is still highly promising, containing some richening work of silver-lead and blende ore. Good progress is being made in Griffiths rise in the back of the 15 west, now up 5 1/2 fms., and the lode yielding saving work of silver-lead and blende ore. Moderate progress is being made in the No. 2 winze, and the lode is still highly promising. The lode in the 150 west, and west of Nicol's winze, the lode is worth on an average 7 tons of ore, or 30*l.* per fathom. The lode in the two stopes in the back of the 150 fms. west is worth on an average 5 tons, or 20*l.* per fathom. In the 140 west the cross-vein is intersected and cut into the side of the lode, and the lode is broken, indicating a more productive lode in the west thereof. There is no other alteration in any part of the mine.

**LADYWELL.**—A. Waters, July 27: In the 32, south-west on New British lode, there is a change of ground for the better, and more water is coming than hitherto; hence we expect to cut main lode soon. No change in tribute pitches. Since my general report was written we have, in trenching close up to the boundary of the mountain proper, cut the main lode, and find it to be rich in carbonate of lead throughout, and of splendid character generally. Two pits have been sunk—one 40 fathoms to the south of the adit end, and the other 20 fathoms to the north of the adit end, the lode in No. 2 being 2 ft. wide, and the lode in No. 1 being 3 ft. wide, and the lode in No. 2 being 2 ft. wide, and the lode in No. 1 being 3 ft. wide, and the lode in No. 2 being 2 ft. wide, and the lode in No. 1 being 3 ft. wide, and the lode in No. 2 being 2 ft. wide, and the lode in No. 1 being



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Argentine, 5½ to 6½; Condes, 5½ to 6½; Chontales, ½ to ¾; Emma ¾ to 1. Frontino and Bolivia, 2¾ to 2½; the profit for the month of May is 10412, and the mines are reported upon as looking well Eberhardt and Aurora, 84 to 88; Flagstaff, 14 to 2; Javali, 68 to 72.



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### Notices to Correspondents.

\* Much inconvenience having arisen in consequence of several of the Numbers during the past year being out of print, we recommend that the Journal should be kept on receipt; it then forms an accumulating useful work of reference.

**NORTH DELAWARE AND BOURTHICK SLATE QUARRY (Cornwall).**—Can any of your readers inform me if the following rumours relative to this property are true?—1. That the land can only be granted a lease for a limited term, which is considered too short for slate quarries.—2. That the percentage of slate compared to the enormous quantity of overburden and rubble is very small.—READER.

**THE COPPER MARKET.**—I am one of the many who have lost somewhat heavily during the last few years in mining, and I do not now come forward with vindictiveness, or loud complaints of "having been fleeced," &c., for I believe that the mines which have swallowed up my capital have been worked honestly, and with every earnest intention to command success; but, as your will, sometimes correct, but often incoherent correspondent, Mr. Barnard, was writing some few weeks since about being able to treat ores by a very economical process, I think the present a very fitting opportunity for him to test his principle, and prove that mining can be successfully conducted even in the present depressed times. It has happened that in adversity good remedial measures have been introduced by which "one and all" were benefited. May we hope that Mr. Barnard can now be able to lend a helping hand in the onward economical movement, by which we all hope to benefit.—SHAREHOLDER.

Received.—"G. R." (Orenburg): Next week.—F. M. F. Cazin (Santa Fé, N.M.):—"T.H."—"S.J."—"One who was present"—"Stannum"—"Shareholder" (Van Consoles)—"B.H."—"J.T."—"No"—"Progress" (Merthyr Tydvil): Next week.

## THE MINING JOURNAL,

### Railway and Commercial Gazette.

LONDON, JULY 29, 1876.

#### THE PROGRESS AND PROSPECTS OF SLAG UTILISATION.

There never was a time when more attention was being given to the successful utilisation of slag than at present, and at no former time did the efforts put forth in this direction promise to yield more satisfactory results. It is probable that the exceptional depression that now hangs over the iron trade has caused much more attention to be given to this matter than would have been bestowed upon it had the production of the material from which the waste vitreous product called slag is obtained been attended with profit. Be this, however, as it may, there can be no doubt of the fact that in every part of the United Kingdom where the manufacture of pig-iron is carried on, and to a large extent outside the boundaries of this country, various attempts, attended with varying results, are now being made to produce from slag commodities that are in every day request, and for most of which there is an exceptionally large and regular demand. In the Cleveland district two companies are carried on successfully on the limited liability principle for the manufacture of cement, bricks, paving blocks, tiles, and agricultural sand, from the waste products of the blast-furnaces. One of these—the Tees Sclerite Brick Company—is chiefly engaged in the manufacture of bricks and paving stones on Woodward's patent, whereby the slag is taken from the furnace and run into moulds, where it is allowed to solidify and subjected to an annealing process. This company has hitherto carried on its operations at the works of STEVENSON, JACQUES, and Co., but it is now making arrangements for constructing new appliances, with some important modifications and improvements at the works of the Lackenby Iron Company. The bricks produced by Woodward's process are largely used for building purposes on Teesside, and the company have now an order for half a million for Stockton. The company's paving blocks have been put down on several leading thoroughfares in Stockton, Middlesbrough and Darlington, and have been proved equal to a very considerable amount of wear and tear.

The Cleveland Slag Working Company is another concern established about two years ago for the purpose of working the joint patents of Capt. BODMER and Mr. WOOD, of the Teesside Ironworks. Works of considerable extent have been erected by this company on Teesside, in the immediate vicinity of the great congeries of blast-furnaces that line the route on either side between Middlesbrough and Eston. The company make a *specialité* of slag cement for building purposes, which has been found to answer admirably in the building of the new station at Middlesbrough, and in the erection of other buildings. For this, as well as for all their other products, there is a wider market opening out, and in spite of the remarkable dulness of trade generally in the Cleveland district the position and prospects of the company are financially satisfactory. Recent attempts have been made to utilise slag in the Coatbridge district, but it seems as if the slag yielded from the Scotch pig-iron was of too watery a composition to answer the requirements of the Woodward process, which after a series of experiments at the works of the Coltness Iron Company was indefinitely abandoned. Negotiations, however, are now pending for proceeding with experiments in the Wishaw district, and the results obtained from some slag found in that neighborhood promise very gratifying and successful results. We believe that Mr. WOODWARD has recently been making efforts to localise his process in Sheffield and other districts, but the present is not a time when capitalists are disposed to give much encouragement to a new thing, and especially to any attempt to utilise that which has hitherto been regarded on all sides as utterly worthless. Great, however, as have been the strides made in the utilisation of slag on the North-East Coast, the enterprising and aggressive gentlemen in that district are not likely to enjoy a monopoly of credit in this matter, for at the present time a company is in course of formation on the West Coast for manufacturing glass from the vitreous products of the hematite iron made in the Barrow district, and when we mention that the Barrow Hematite Iron and Steel Company, of which the Duke of DEVONSHIRE is Chairman, and Mr. JOSIAH T. SMITH general manager, have no less than 16 furnaces of their own, it will at once be seen that there is plenty of scope for such an undertaking, so far as the available supply of slag is concerned. The process by which it is proposed to make glass at Barrow is patented by Mr. B. BRITTON, and consists of taking the slag as it issues from the blast-furnace, conducting it to a tank, and there mixing it with various chemicals, which give it the transparency and the consistency of glass. From the results already obtained in repeated experiments it is claimed that the glass produced by this mode will be acid proof, and capable of being applied to all purposes for which the best bottle glass is used. At the Wellingborough Ironworks also efforts are now being made to effect the utilisation of slag for this and kindred purposes, and the results obtained are said to be very satisfactory indeed.

Those who visited the Royal Exchange at Middlesbrough on the occasion of the recent quarterly meeting of the iron and allied trades would, probably, be struck by a woolly looking substance made from slag, which was exhibited by Mr. CHARLES WOOD, of the Tees Ironworks. This curious material was produced by blowing steam through the slag as it issues from the blast-furnace. Several suggestions were made for its profitable utilisation, and Mr. WOOD himself stated that he proposed making experiments with a view to its employment in the manufacture of paper. It has, however, been made on the Continent, and used for a considerable time past, for a very different purpose. At the Essen Works, in Prussia, Herr KRUPP, the famous ironmaster, has made slag wool for covering boilers and steam pipes for at least three years, and has proved that a single ton of this so-called "silicate cotton" will cover, with a layer 24 in. thick, an area of 500 square feet. It only requires careful building to retain this covering in position, and from its fibrous character any leakage is easily perceptible. Samples of this slag wool were also shown at the Vienna Exhibition, and attracted a good deal of attention. We are afraid, indeed, that we must concede to our continental rivals the credit of having been before us in the successful utilisation of this as of other waste products that might easily be enumerated. Some years since a mode of disintegrating slag nearly similar to that now adopted at the Tees Ironworks, Middlesbrough, by the Cleveland Slag Working Company, was adopted at the Sclasin Ironworks, near Liège, a small water-pipe being placed below the slag run off the furnace, so that the molten slag as it runs down is

met by the rush of water from behind, and is thus broken up into the state of coarse sand, which, after falling into a sump in front is lifted up by ordinary chain buckets, and either loaded directly into railway wagons or otherwise disposed of. We believe it was Mr. MINARY, director of the Franche Comté Iron Company, who first conceived the idea of utilising slags by granulating them as they came from the blast-furnace, using for this purpose an engine actuated by the gases of the furnace, and requiring hardly a single horse-power. At these works, which consist of five blast-furnaces, each producing 20 tons of iron in the 24 hours, the utilisation of the waste vitreous products in this way effected a saving equal to the wages of 20 men employed in charging the slags, and of five blacksmiths who prepared their tools.

There is undoubtedly a very wide field yet awaiting occupation in this direction; and although much has already been done, a great deal more is required to obtain to the full extent the results that are desiderated. It has been shown by the continuous experience of many months that slag may be profitably utilised in the production of ordinary building material; but this is not enough. It contains ingredients which ought to be, and we believe in course of time will be, applied to much more valuable purpose. A process or processes are still required for the refinement of the slag, for unless it is carefully refined and separated from all extraneous ingredients it cannot be profitably employed in the production of articles of commercial value to which it is now proposed to apply it. Basalt and volcanic rocks have been employed in various countries in the manufacture of glass, and some slags are almost of the same chemical composition as basalt, which has, no doubt, suggested their use in this important branch of manufacture. Already in some parts of Belgium arrangements have been made by glass manufacturers for the supply of a certain quantity of slag, which is run out on cast-iron plates, and cooled with water, previous to being used. It would not be wise to expect too much from the employment of slag for this or any cognate purpose; but, at the same time, it need not cause surprise if from the experiments and researches now being made in various quarters some process were evolved that would lead to a complete revolution in the glass trade, to say nothing of what may be done by the employment of this inexhaustible material in other industries.

#### THE IRON AND STEEL TRADES.

The science of steel and iron making should be largely promoted by the summer meeting in Birmingham of the Institution of Mechanical Engineers. Not even at the meetings of the Iron and Steel Association has the question of machine puddling ever been more thoroughly ventilated. Mr. CRAMPTON's paper furnishes a compendium of all that has been done, and it brings the information down to the latest moment. Aided by the illustrative diagrams even those engineers who have not yet seen the Crampton furnace in operation at Woolwich were able thoroughly to master the invention. And the abundance and variety of the specimens of steel and iron which the furnace has assisted to produce, which were shown upon the tables, amply illustrated what the furnace can be made to do. The trade should now be able to manipulate without hindrance masses of iron certainly up to half a ton in weight. This to mechanical engineers is a matter of great interest, and so certain of them express themselves. They attach to that fact more importance than they do to the ability which ironmasters now possess to puddle largely without the interposition of the puddler. Mechanical engineers are not, however, all practical ironmakers, and their satisfaction at the facility with which by the revolving puddling furnace large masses of iron can be manipulated was not increased by the experience of a member of the Institute, who is a practical ironmaster, and who, moreover, at great pains and a large outlay, has, for a good two years and a-half, been trying to solve the problem of the rotary puddler.

Then Mr. JEREMIAH HEAD no one has thought more highly of the Crampton furnace. He watched its operation narrowly, and with great interest at Woolwich. What he saw there induced him to begin as long back as we have mentioned to try to use it in the puddling of iron at his works at Middlesbrough. So satisfied was he with the advantages of the apparatus that he had six of the furnaces erected, and Mr. CRAMPTON showed, as amongst the choicest specimens of his samples, sections of boiler-plates rolled by Mr. HEAD. On his own part, Mr. HEAD was very frank, and as a man of science talking to men of science, he desired to be exact. He was inclined to think that, to use his own phrase, nothing would be gained by making everything the colour of the rose. Mr. HEAD wished it to be understood about the boiler plate section that the plate was not all equally irreproachable. His experience of the working of homogeneous masses of puddled iron was that, when cold, it displayed surface imperfections which did not appear when the iron was hot. Every ironmaster knows too well for how little a defect a large and costly boiler-plate will be rejected by engineers who are determined to obtain purity and strength in such iron, and how great is the loss which comes about when a completed plate has to be cut up and again passed through the furnace. The mechanical engineers were hardly prepared to hear that Mr. HEAD, after what he has done with the rotary puddler, should be compelled to say that in the present state of the science of machine puddling he prefers to make a plate of piled iron. Nor has Mr. HEAD's experience been such as to enable him to endorse Mr. CRAMPTON's views as to the extent to which by the revolving furnace manual labour is dispensed with. Mr. HEAD puts to the debit side a greater cost on that account than Mr. CRAMPTON would charge. It was with much surprise that the mechanical engineers learned that the fettling requisite for a Crampton furnace involved an outlay at the rate of 2*l.* to every ton of puddled bar. Mr. CRAMPTON, it is easy to understand, would not attribute so much importance to surface defects in a plate as some of his brother engineers. Unquestionably greater depreciatory significance is attached by engineers to little blisters upon the surface of the boiler-plate than the iron sometimes merits; still, they are the buyers, and enforce the conditions upon which they buy. So long, therefore, as an unblemished surface is stipulated by the engineers, so long must the ironmaster see to it that the plates which are turned out in his mills are blisterless. The cost of fettling Mr. CRAMPTON met very patiently, when he said that though the fettling when it was put into the furnace cost the money which Mr. HEAD had quoted, yet when it was taken out it was worth, as puddled iron, twice as much, then the more fettling the better for the interest of the ironmasters.

If, however, practical ironmakers cannot yet accomplish all they could wish in the making of iron with the rotary puddler, it would appear to be likely that in their capacity as steelmakers they may yet find it of vast service. It is scarcely possible for higher testimony to have been given under this head than that supplied by Mr. WEBB, the famous locomotive superintendent of the London and North-Western Railway. Mr. CRAMPTON had amongst his specimens a section of steel rail of which the base was Cleveland iron. That iron he puddled at Woolwich, and the puddled ball he sent to Crewe. Here it was passed through the Siemens-Martin furnace, mixed with a little No. 3 hematite and 5 per cent. of spiegel-eisen. Of this mixture the steel rail was made, of which Mr. CRAMPTON showed the specimen, and a splendid rail it was. The phosphorus indigenous to the ironstone of the Cleveland hills, by reason of its fish origin, was wholly eliminated, whether in the puddling-furnace or in the Siemens-Martin is not clear. Anyhow, the hateful hindrance to the making of steel and first-class iron from Cleveland ore was got rid of somehow. Dr. SIEMENS aims at getting rid of it by the direct process, but we are not aware that as yet even the Siemens-Martin furnace has been potent to make good steel from Cleveland ore. Mr. WEBB has great faith in the Siemens-Martin, and with its aid is produced from scrap iron and scrap steel rails for which he claims superiority to any in any manner produced by the Bessemer process, yet at a cost of from 10*s.* to 12*s.* under that of Bessemer steel. And Mr. WEBB should know, for he has both Bessemer and Siemens-Martin plant at Crewe, where he produces 200 tons a week, mostly from iron and steel scrap. Mr. HAWKLEY has views relative to what may be done with the Bessemer plant in the way of attaining the object which is aimed at in Cleveland,

where it is still believed that the native hills may be turned into good steel, but we hardly think Mr. HAWKLEY would have advanced the views which he expressed in Birmingham last week if he had not fully read Mr. BESSEMER's specifications. But we quite concur with him that, however wanting Mr. CRAMPTON's furnace may appear in securing homogeneous purity, it appears capable of largely assisting in the work of utilising sulphurous ore in the making of steel.

#### MINING OPERATIONS IN NORWAY.

In reporting on the trade and commerce of Norway for the year 1875, Consul-General Jones makes some brief remarks on this subject, of which the following are the more noteworthy features.

The proceeds of the mining operations during the year were, in his opinion, less than usual. The State silver mines at Kongsvold, have yielded annually during the last four years an average of 15,500 marks of fine silver, valued at 10,335*l.* A lode has lately been discovered at the silver mines of Vinorem, which promises to be profitable.

**IRON.**—Of the Norwegian iron mines two only were able to keep their furnaces at work during the past year. Some inconsiderable shipments of ore were made. The lodes discovered in the neighbourhood of Bodø have disappointed the expectations formed as to the quality of the ore, which turns out to be very inferior.

**COPPER.**—The yield of copper has been under the average. Operations have been recommenced on the old works of Hougeund with Norway in 1875 was about 14,000 tons.

**NICKEL.**—Nickel mines have yielded good and profitable returns, although the prices of this metal have declined. Most of the works now smelt their own ores, but the ores of the Espedalen mines are sent abroad for this purpose, as the furnaces are not yet erected. The mines of Senjen, which are owned by Englishmen, prove a source of considerable gain to the proprietors. The official statement shows that during the past year they have yielded 120 tons of metal, which, at the rate of 1000*l.* per ton, represents a total of 120,000*l.* Of fresh mines, those in the Sigval appear to our Consul-General to be the most promising, and the works there will shortly be in a position to smelt their own ores. Many new mines of nickel have been opened, some of which will, doubtless, prove remunerative.

**PYRITES AND APATITES.**—The amount of pyrites and apatites exported was very nearly the same as in the previous year—a total of 40,000 tons. No new mines of the latter have been discovered.

**COAL.**—The coal mines opened in the Island of Joederen have so far proved to be of no value.

**GOLD.**—Gold washing is still carried on in the Jans river (Finnmark), but since the commencement in 1869 has only yielded 10,532 grains, nor does there appear any reason to hope that it will ever be a more important source of wealth to the country.

Writing from Gottenburg, Mr. Consul Duff reports that the coal fields in the south part of the country do not appear to yield either the quantity or the quality of coal expected from them, but large works have been built for the manufacture of fire-clay goods, and as far as can be seen at present these manufactories promise to be successful and profitable. Coal and coke, pig and finished iron, as well as plates and bars, it may be added, form a very large figure in the imports into Gottenburg.

#### THE PULSOMETER.

In the Supplement to this day's Journal we give a fully illustrated description of this invention, of which the manufacturers, Messrs. HODGKIN, NEUBAUS, and Co. have just made a very striking display in action at the Birmingham meeting of the Royal Agricultural Society, where the Pulsometer was recognised as the novelty of the Show—one of the smaller sized pumps, costing 40*l.*, and supplied by steam through a 3-in. steam-pipe, discharging continually 10,000 gallons of water per hour, drawn from the lake at a distance of 190 feet. The flow of water was without intermission, and its regularity and volume attracted the attention of crowds of visitors throughout the week.

The important features which recommend this pump to all those who require to raise larger or smaller quantities of water to a moderate height are the following:—

- The pump can never be worn out.
- It will pump sand, gravel, or grit without suffering injury.
- It needs no skilled attendance.
- It never requires oil, tallow, or packing.
- It is cheaper than any other pump, and requires less space.
- For well-sinking it must prove a great boon, as it can be fixed in position where a centrifugal pump could not be used, and where any of the other forms of steam-pumps would be rendered useless in a week by the action of the gritty matter. Large sizes were also exhibited with equal striking results. Our illustrations show the way in which the Pulsometer can be used in sinking a well or making any other excavation: it is simply suspended by slings, and is lowered as the water lowers, discharging the sand and mud together with the water through the flexible rising main.

#### THE SELECT COMMITTEE ON EMPLOYERS' LIABILITY FOR INJURY, &c.

Some singular if not extraordinary evidence has been given before the above committee that makes one wonder at the peculiar views that some persons have of what is right and just. The great point which Mr. MACDONALD strove for in his Bill was to fix on employers—more especially on mineowners—liability for any accident that took place by which one servant was injured by negligence on the same employer: it did not matter whether by negligence of otherwise the master was to be held personally responsible for every act committed by a person in his employ which led to injury. Anything more illogical or preposterous cannot well be conceived. We before pointed out, when noticing Mr. MACDONALD's Bill, that where the carrying out of an order given by an employer himself led to injury to anyone, there could be no doubt but that the employer was responsible. But it is a very different thing, say, when two men in the same employ through their own carelessness or negligence injure themselves, or when one injures the other. The law as it at present stands is that the master shall be liable for the acts of his servants when he expressly orders them to do certain things, or personally co-operates with them in carrying them out.

That appears to be fair. But Mr. MACDONALD and others think that the master, being presumed to be a capitalist, should be made to pay for any accidental injury to a servant, even if caused by his indiscretion, and of which his employer could not have the slightest cognizance. Singular to say, we find this view participated in by gentlemen of high culture, and who have studied the subject. Thus Mr. C. P. ILBERT, on being asked whether he considered an employer should be held responsible for a thing over which he had no possible control, said he ought to be, although he admitted it would be a case of great hardship. He considered that such liability should be fixed on the employer, on the grounds of "public policy." On the same grounds he thought that a person perfectly guiltless should be proceeded against, so that the innocent would be held guilty. We certainly cannot see the force of that public policy which makes the person innocent of all knowledge of a certain act guilty of it, nor do we think very highly of the legal mind that arrives at such an extraordinary conclusion. Mr. BROADHURST, a well known trades unionist, of course took the broadest of broad views, and considered it only just that where there should be bodily injury caused to one servant by the negligence of another in the same employ, it should not be any ground of defence that the cause of injury was due to the negligence of such person in the same employment. Were such to become law it would take all responsibility off workmen, or it might even be that a man would actually injure himself to a small extent for the purpose of obtaining compensation and getting off work for a time.

That the law relating to masters and servants as it stands at present is a fair and just one, few who can take a disinterested view of



It can deny, and such is the opinion of most of the Judges, one of whom who has tried many cases states that the proposed alteration of the law would do mischief. Mr. BROWN, Q.C., takes a very different view from his brother barrister Mr. ILBERT, who considers that wrong ought to be done, and the innocent suffer on the ground of public policy. Mr. BROWN, speaking of the class of men who most frequently meet with accidents in mines, and from what he knows of them from a Court experience, was of opinion that any law which shifted the responsibility from the workman to the employer would have a tendency to make the former more reckless than they now are. To those who have any knowledge of our mining population the views of Mr. BROWN will be fully endorsed. Mr. MACDONALD, of course, must show the miners that he is their friend, but we cannot hear of many of them that care much for the Bill he introduced presumably on their behalf. He has lost his popularity amongst a vast number of those who formerly gave him their hearty allegiance, and his latest effort to bring it back will only end in failure, for he has tried to obtain what he has hitherto opposed—class legislation—so that employers should be taxed for the negligence of the workmen.

**MECHANICAL PUDDLING.**—At the Middlesbrough Royal Exchange, on Tuesday, Mr. D. Hope exhibited a plan descriptive of his scheme for the production of mechanical puddling by an oscillating furnace. The inventor claims for the furnace simplicity of construction, durability, and economy; and the usual "fettling" of an ordinary furnace is said to be applicable.

**WREKHAM EXHIBITION.**—The model of the Shropshire lead mining district which obtained a prize medal in the Exhibition of 1862, and the pig of lead with an inscription of the Emperor Hadrian and the spades which give the name to the "Roman" Gravels Mines, are exhibited in this Exhibition, by Mr. Jasper More. The former, from what Sir R. Murchison pronounced its extreme accuracy, forms a valuable source of reference for shareholders in these mines, saving a visit to the district. Mr. H. F. Brion, of 231, Albany-road, London, a purpose taking a relief map of this model, 30 in. long, with the minutest details as to veins, &c., if a sufficient number of gentlemen agree to subscribe beforehand. Those interested in the matter are requested to communicate with Mr. Brion.

**WEST MOSTYN COLLIERY.**—A splendid seam of coal, 9 ft. thick, has been reached at 90 yards from the surface, and the works are rapidly progressing most satisfactorily.

**LEICESTERSHIRE COAL FIELD.**—On Monday the Dudley Geological and Scientific Society paid this district a visit, and although the party was rather small the excursion was evidently enjoyed. On leaving Coalville station the first call was made at the Encaustic Tile and Terra Cotta Works, when they were shown round by Mr. Eratt. The party next proceeded to the Whitwick Colliery, where they were joined by the Chairman and directors of the company, and luncheon was partaken of. The large sections of the strata passed through in sinking down to the deep coal, and plans, elevations, &c., of the whole of the new plant now in progress on the surface were inspected. Mr. W. J. Harrison, F.G.S., of Leicester, then gave a short lecture on the coal formation of the district, explained and illustrated by diagrams, which was greatly appreciated by the ladies and gentlemen present. The party next descended the new shaft along with several gentlemen of the district, the Rev. Mr. Tollemache, and others (who had come to join the association), under the escort of Mr. J. Harrison, F.G.S., of Coalville. The gentlemen descended in their black coats and light cloths, and passed through the levels that are now being headed out for the new workings. The roads are 12 ft. in width, and 7 ft. in height, with a magnificent coal roof of 4 ft. in thickness, which was greatly admired and commented on by all present. Sections of the coal were cut through in different places to show the thickness of the seam, which continued 8 ft. 2 in. The party was then conducted to the residence of Mr. W. Whetstone, Broomleys, when a grand collation was provided for all present. Excursions were afterwards made to the Monastery, the Hanging Stone, Barton Hill, and various other places of interest in the district. The coal trade in this neighbourhood seems rather quiet, the pits only working half time. The new work at Ellistown and the South Leicestershire Collieries is progressing. At the Lindridge Colliery, Desford, which has been sunk some time, they are driving out in search of the coal.

**COAL AND IRON IN THE UNITED STATES.**—The authorities of the Boston Navy Yard have been instructed to make some 5-inch steel wire hawsers for the United States Navy department. The Connecticut Railroad Company has laid with steel 41 miles of the 73 miles of its main track. The directors observe in their annual report:—"The present cost of steel rails is such that no road can afford to use iron in its renewals of superstructure." The total production of anthracite coal in Pennsylvania to July 1 this year amounted to 7,673,891 tons, against 6,342,677 tons in the corresponding period of 1875, showing an increase of 831,214 tons this year. The production of bituminous coal in Pennsylvania to July 1 this year was 2,134,118 tons, against 1,934,463 tons in the corresponding period of 1875, showing an increase of 189,655 tons this year. Combining anthracite and bituminous together, the coal production of this year will be seen to have increased to the extent of 1,016,869 tons. In the course of May the Union Pacific Railroad Company laid down steel rails to the value of 74,105. American iron rails are quoted at the works at \$40 to \$43 per ton currency; old rails are quoted at \$21 to \$22 per ton currency.

**DURHAM LEAD MINING DISTRICT.**—On Monday, July 24, operations were commenced at the Old Dryburnside Mines, near Frosterly, in Weardale; these mines are bounded on the north by the River Wear, on the south and west by the Beaumont and London Lead Company's splendid mines. The Dryburn lodes run direct into these properties. About 80 years since the upper sills and strata were wrought by means of shallow adits, when very large quantities of ore were raised and sold. Influx of water prevented the prosecution below a certain point, and adverse interests stultified unity of action; all these difficulties have been removed, and the works will be undertaken from the level of the River Wear. A deep adit has been partially executed, but from entering other boundaries had been suspended; this will enable the ground to be wrought from an altitude of more than 1200 ft., through the well-known Nattrass Gill, Quarry and other hazels, as well as the first, second, 4-fathom, and 12-fathom limestone. The management has been confided to and undertaken by Mr. George Henwood.

**MINING IN CARDIGANSHIRE** and the adjoining county may now be considered not only a fair, but perhaps an unusually advantageous subject for investment; the extraordinary demand for all classes of mining property, caused by the wonderful success of the Van some years since, has had its run, and many worthless schemes have died away. Amongst the remaining mines now at work no doubt there are many that will prove anything but remunerative, but the general state is being fairly developed, and each possesses some peculiar indication of success, or presents an inducement for further development. The prices also of the various shares in the mines, both dividend and progressive, have come down to something like reasonable figures; the celebrated Van, for instance, is now reduced to a price at which the shares may be considered a fair investment, whilst some of the progressive mines which were introduced at high premiums are reduced to a figure more suitable to properties which are at the best but speculative. Amongst the most successful mines lately introduced the Grogwinion presents an example of the great advantages possessed by many of the mines of Cardiganshire, which may be worked to almost any extent above adit, or, in other words, without the aid of pumping or drawing machinery, at the same time having the assistance of unlimited supplies of water from the rivers for the purposes of washing the ores and working the dressing machinery. The Temple Mine, which has lately been commenced, possesses the same advantages as the Grogwinion, and, as far as the development has gone, has proved highly successful. Another mine in the same locality—the Great West Van—is reported

to be improving, a cross-cut during the past week having intersected a lode worth 50L per fathom for lead.

**THE COMMISSIONERS OF PATENT AND TRADE MARKS.**—The recent decisions of the Commissioners, who are now for all practical purposes final authorities in such matters, are to the effect following:—A royal crown, regarded either as a public emblem of royalty or as an emblem denoting quality, cannot be considered by them as sufficiently distinctive to form part of a registered trade mark which has not been used in the ordinary way of business before Aug. 13 last, when the Registration Act passed into law. The like inhibition extends to public buildings, national arms, flags, &c., the arms of boroughs, and so on. Further, no exclusive title can be conceded by the Commissioners to any words whatsoever of quality or advertisement, such as superior, finest, cheapest, warranted, patented, &c., as belonging to new marks, nor can they in connection therewith be recorded in the official register.

#### REPORT FROM CORNWALL.

July 27.—It does not seem at all unlikely that we shall see an agitation against the present system of dues. There was certainly nothing new urged in the remarks at West Basset the other day, but it is in itself somewhat new to find them stated at such a place, and in such a way. From first to last we have always contended that the arrangement with regard to the occupation of land and the payment of dues should be fair for both parties alike—the landlord and adventurer; whereas at present, or rather we should say under the present system, all the advantage is with the former. We say under the present system, because, fortunately, that is not strictly carried out by many a mineral lord, but it is common to find the dues reserved either reduced to a moderate amount, or given up during pleasure; and, in fact, if this was not so the system could never have lasted until now. If all landlords had insisted upon their full dues, as Mr. Fortescue has done in the West Basset case, one of two things would have happened long ere this: either mining would have been practically annihilated, or the lords would have been forced to give way by a general combination on the part of the mining interest. It is clear, however, that if delayed thus a change must be made. Dues must be paid on profits only, and mineral lords must be content with that, and fair payment for surface occupation and surface damage; nor is there any reason why these payments should not be made on a liberal scale. Who is the first mineral lord who will earn the everlasting gratitude of the mining community of Cornwall, and what is, perhaps, of more practical utility, strengthen his own interests by adopting the new principle? 100L an acre for land, and 1-10th dues on profits, would be fair and reasonable for both parties.

Whether the great Penryn foreshore case will pass through another stage or not remains to be seen. This week it has come before Baron Amphlett, at the Bodmin Assizes, and judgment has been given for the plaintiffs—the Mayor and Corporation of Penryn. It is really almost impossible to understand how any other result could have been anticipated. Foreshore rights throughout the kingdom originally belonged to the Crown, and to the Crown or its grantees they must belong still. Now, the manor to which they were attached at Penryn belonged to the Bishop of Exeter; and at Penryn, therefore, the foreshore rights must either have been vested in the see of Exeter, the Crown, or the Duchy of Cornwall, to whom, on its creation, the Crown devolved a large number of manors and manorial rights, while by the recent award of Mr. J. Paterson, in 1857, and a consequent Act of Parliament in 1858, it was decided that as between the Crown and the Duchy the foreshore of Cornwall belonged to the latter. This being so, the Duchy sold its rights, and with them practically those of the Crown, to the Ecclesiastical Commissioners, in whom were already vested the rights of the see of Exeter, and then the Corporation of Penryn bought the lot, uniting in themselves the titles of Crown, duke, and bishop combined. Really the only thing set up against triple claim was custom, and on this, in deference to the opinion of the judge, no evidence was given. It is a pity the case was ever begun, for, as matters stand, our legal friends are the only ones who seem likely to derive any benefit. We have not heard of any minerals under the Penryn foreshore, the dispute there relates entirely to surface procedure.

It is gratifying to find that the losses of our local mines by the winding up of the Copper Mines Association will not be heavy; it is estimated at about 3000L.

#### REPORT FROM NORTH AND SOUTH STAFFORDSHIRE.

July 27.—The class of finished iron for which South Staffordshire is best and most reputedly known—forge bars of high quality—is in more than moderate request. Firms occupying the foremost position in this branch of the iron trade have no difficulty in keeping their forges and their mills on four days and four nights a week. For such iron our maximum quotation of last week (9L 12s. 6d.) is readily got for the Earl of Dudley's iron. Best sheets are likewise in slightly improved request. Good boiler-plates of superior brands are selling steadily, and the enquiry for medium and common sheets has not fallen to zero. On the contrary, there are firms who report themselves slightly better off this week than last, but the new orders are not for heavy quantities. Common bars have fallen, together with strips and hoops, to a very low figure. It is now possible to get Staffordshire bars at under 6L 10s. It has been a long time since such a quotation ruled, and the wide difference between that price and 9L 12s. 6d. leads the market to look for ease upon the maximum. Whilst the bar firms outside those of the A1 class do not report any improvement as a whole, makers here and there report a faint improvement in the demand from local merchants, but at prices declared to be unremunerative. Pig-iron is abundant, though there is no increase in the local production, which keeps very low. Best pigs hold their own at from 4L 5s. to 4L 10s. for all-mine hot-blast; but cinder qualities are plentiful at 2L 10s., and a good order might be placed at within that figure. From other districts the importations are likewise falling off somewhat for forge qualities, but foundry iron, without being in active, is in less unsatisfactory demand. Good ironstone is more than usually abundant, and is held for prices which will compensate mineowners. The prices offered by pig-making firms who do not get from their own mines all they need leave no margin of profit. It is noteworthy that in connection with the manufacture of pig-iron in South Staffordshire the Cowper method of heating the blast, which has been found so very effective in the North of England, is about at length to be applied. Messrs. Cochrane, of Woodside, are erecting two of Cowper's hot-air furnaces. The effectiveness of the apparatus will be in excess of present requirements, but Messrs. Cochrane anticipate larger requirements hereafter. There ought to be a saving of at least 6 cwt. of coal to the ton of iron produced to compensate Messrs. Cochrane for their extra outlay.

The Coal Trade is more than usually dull, even for July. Much effort is made to uphold orthodox quotations for best qualities, but the exigencies of colliery proprietors who intend to carry on their pits makes universal success impossible. Reductions in thick coal are not seen upon every hand; but they are noted in cases in which weakness is not usually earliest shown. Some consumers might supply their wants at less than a fortnight and three weeks ago by from 1s. to 2s. per ton. Inferior samples are plentiful at from 7s. 6d. to 8s. 6d. for forge qualities.

The Mines Drainage Commissioners have determined to carry out as far as they are able the reports which we summarised last week of the arbitrators—always supposing, however, that they receive such encouragement as they have a right to look for from the colliery owners most interested. The Bilston Committee have determined to recommend the levying for next year, which begins early in August, of the maximum rate of 6d. upon all minerals brought up, and to divide it amongst all the people pumping in the district at the rate of so much per lock of 25,000 gallons raised 100 ft. The sum is to be determined by the amount which the rate may yield. Desiring to know if the firms who are pumping will accept these terms, the committee have issued circulars. Meanwhile they have given a fortnight's notice to the firms who are now pumping under subsidy from the commissioners. The maximum rate is likewise proposed to be levied in the Tipton district, and Monday next is

fixed for appeals against ratals under the proposed order. On the following Wednesday there will be an annual election of 10 commissioners. The commissioners who retire are—Messrs. George Addenbrooke, John Aston, Boaz Bloomer, W. V. Dawes, H. O. Firmstone, H. Hall, James Holcroft, Samuel Minton, W. M. Sparrow, and J. E. Swindell. They are all eligible for re-election. The work of the commissioners seems likely to be aided by a communication which has been addressed to the board by the Government Inspector of Mines for the district, who speaks not only on the great financial loss which the flooding at the mines will occasion, but notices the great risk to human life below ground which would follow such a calamity.

Throughout North Staffordshire there are serious complaints about the state of the mining and the pig-making industries, but at the mills and forges there are a few more orders, and the hands are employed longer hours.

A depth of 83 yards has been reached at the sinkings on the estate of the Hamstead Colliery Company. What are believed to be the water measures have been passed through. The sinking at the one shaft has been suspended for the present, and a new shaft has been commenced.

On Friday last a section of the Institute of Mechanical Engineers visited the celebrated limestone pit of Messrs. Dixon, Barnes, and Co. at Dudley Port. They were met on the surface by Mr. William Bristow and Mr. David Peacock, and the secretary of the party, Mr. Barlow, explained that although a very large party had put down their names most of the members had been unable to attend. The party then explored one of the finest pits of the kind in South Staffordshire. Great interest attaches to it as being one of the places where the Dudley or Wenlock limestone has been extensively worked below the coal measures of the district. Previous to its opening the only means of supplying the blast furnaces for smelting was from open workings at Dudley Castle Hill and Wren's Nest, and a little at Walsall. The depth of Messrs. Dixon's pit to the bottom of thick coal is 123 yards and at a depth of 185 yards the coal lies on the Wenlock shale, which is inter-mixed with inferior limestone. At a total depth of 230 yards, the party came into the workings, and a most beautiful sight met their view. There were about 15 acres of open workings and roadways, and the pillars supporting the roof were illuminated with 3840 candles, making a complete fairy spectacle. Various coloured fires were set alight at intervals, and these lit up the massive pillars, 14 ft. square, in a weird and fantastic manner. After tiring themselves in wandering about the extensive workings, the parties proposed a hearty vote of thanks to the firm for their reception of the members, and then a hearty vote was given to Mr. Bristow and to Mr. Peacock for their courtesy in exhibiting and explaining the pit and its belongings. Just before leaving some 20 or 30 shots were fired for the amusement of the visitors, and a large quantity of material was brought down.

#### REPORT FROM MONMOUTHSHIRE AND SOUTH WALES.

July 27.—The report this week is not of a more encouraging nature than last. The prices at which orders are offered are in many cases so low that manufacturers are compelled to decline them, and at many of the works the men are employed only short time. A clearance of iron has at last taken place in the direction of Turkey. To Canada a large shipment of rails has been made, and for the Cape, India, and Sweden requirements are in course of execution, but business is very dull. Pig-iron is still in limited request, although a few fresh orders have been recently given out in the district. The Landore Steel Works are yet idle, and no signs of their re-starting are apparent. Generally speaking, although rails are in fair request the steel works are not so actively engaged as was the case a few months ago. At the Tin-Plate Works the restriction of make is maintained strictly. At the same time, buyers are still backward in making purchases, and the prices offered in many cases are far from being remunerative.

The Coal Trade is also depressed. There is a want of tone in the market. Though the output is considerable shipments are not equal to it. The foreign demand has fallen off slightly, and coastwise business must again be reported as very bad. In the anthracite district, disagreements between the men and their employers have recently occurred in consequence of reductions either enforced or sought to be. At the Waunacgarwen Collieries the men, it is believed, will be asked to submit to a reduction of 12½ per cent., if not more. They are very disinclined to this, and a meeting of the men has been held, at which it was agreed to adjourn till next week, when a general meeting of the workmen employed in various collieries will be present.

The Cardiff and Swansea Coal Company's report for the year ending April 30 shows a loss, but against this must be put an item for debenture interest charged against revenue. Once the arrangement with the vendors is carried out a large portion of this will not be due. The output from the whole of the pits has been during the year over 200,000 tons.

The inquest on the men killed by the explosion on board the steamship Atlanta, at Penarth Dock, has concluded in a verdict of accidentally killed. The explosion was caused by one of the men lighting a match between decks, and which ignited the gas from the steam coal loaded. The chief officer was also blamed for not having used more care with regard to ventilation. The captain admitted that he did not know the coal was of a gaseous nature.

Mr. Thomas Halliday has addressed a long letter to a local paper, in which he speaks in a congratulatory tone of the progress of conciliation as evidenced by the formation of the South Wales Board. Of course he attributes this in a great measure to the working of the Unions, and says he always advised adhering "to the Bible principle of settling disputes by reasoning together." The main object of the latter, however, is evidently to gain adherents to the Union, which Mr. Halliday admits is at a low ebb. And with all due respect to the great agitator, I believe it is likely to continue so in this district, for the men have had enough of Unions, especially the thinking portion of them, who begin to see that one of the main results of non-submission to necessary and reasonable reduction has been the driving away a large portion of the trade of the district.

An important meeting of delegates will shortly be held for the purpose of drawing up a code of contract rules to be used in the associated employers' collieries. At the suggestion of the masters a deputation will be appointed to meet their deputation.

An explosion in the early part of this week in a new shaft being sunk for the Ebbw Vale Company, at Cwmcare, three men were killed and one injured. A blower of gas ignited, hence the catastrophe, which is said to be due to the carelessness of one of the men who carried a naked light.

At the West Mostyn Colliery a splendid seam of coal, 9 ft. thick, has been reached at 90 yards from the surface, and the works are rapidly progressing most satisfactorily.

**EXPERIMENTS WITH LITHOFRACUTEUR.**—Mr. Thos. Whatmough, agent in South Wales for the sale of lithofractor, has been recently making experiments with this powerful explosive, to show its great practical value, and its safety from explosion, except when caused by the fuse and detonator. In addition to previous experiments Mr. Whatmough, a few days ago, initiated operations at the Mumbles Limestone Quarries. The first experiment was for the purpose of illustrating its non-explosiveness except in the way prescribed by the instructor. A large bonfire was made, and a 5 lb. box of the lithofractor was placed in the centre, but it did not explode, thus showing that should the place where lithofractor is stowed be set on fire no explosion would take place. In a second experiment a cartridge was placed with its end on a block of stone, and fired, but no report followed, but the same when fired with a fuse and detonator split the rock in pieces. The next was a tube experiment, showing the advantages of lithofractor as an excavator. A 2 ft. hole was made in a block of stone of over 100 tons, when 5 lbs. of lithofractor was put into the cavity and fired, and the stone fairly split in half. Another experiment was tried, without boring, on the other side of the block, and was so successful that it split the stone into fragments. To show the cartridges will not explode by concussion a 5-lb. package was thrown from the top of the hill to the rocks below, the only effect being to break the cartridge. The event of the day, however, was the placing of 15 lbs. of lithofractor in the fissures of a large projection of rock. Orders having been given to stand clear, the fuse was fired, and after a few minutes of anxious waiting the whole face of the rock was lifted, and some portions of it were thrown 200 yards out to sea. A subsequent examination showed that the rock was shaken from its base to the top of the hill, and could, of course, be easily removed. —South Wales Daily News.

#### REPORT FROM DERBYSHIRE AND YORKSHIRE.

July 27.—Coal mining is by no means such a profitable business as it has been, and colliery owners in Derbyshire now complain not only of the low price at which they are obliged to sell, but of the very moderate business that is being done. So much is this the case that at many large collieries the men are not working more than four days a week, and at some even less than that. The demand for London is very quiet, and the competition for what trade there is particularly keen. Not so much is being done with the West and South of England, the consumption having fallen off very much of late. There has been a better enquiry for steam coal, but considering that this is the best part of the year for that description of fuel there is not so much doing as might be expected, whilst prices have not advanced. Engine fuel is plentiful, and is being sent from the neighbourhood of Staveley, and other places as well, into Lancashire by the Manchester and Sheffield Railway. At Sheffield the men appear to be working tolerably well, and as co-operators, no doubt, are looking forward to future benefits. These, it is to be feared, they are not likely to realise, for as the colliery has hitherto been worked at a loss when the price of coal was much higher than it now is it does not appear quite clear how it is to pay now. We are promised some very active competition between the Midland and Great Northern Railway Companies for the mineral traffic to London and the South. The new lines of the Great Northern from Nottingham to Derby is being pushed forward, and that part between Nottingham and Pinxton is all but ready for being gone over by the Government Inspector.

With the exception of one or two of the heavy branches, the Sheffield trade is in a very depressed state, and many hands are working short time. In armour



1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.



COMPANY  
IN CHARGE  
TO BE SOLD  
BY PRIVATE TREATY  
BY THE EXECUTRIX OF THE  
LATE GEORGE PELL, ESQ., DECEASED, ALL THAT VALUABLE  
HEMATITE IRON ORE MINE, situated at LINDAL-IN-FURNESS, and  
known by the name of—  
“BERCUNES.”  
As the same was recently worked by WORDSWORTH HARRISON, Esq., J.P., together  
with the ore at bank, about 100 tons, and the following MINING PLANT:—  
ONE STEAM BOILER with fittings, 800 feet of steam piping, 2 winding gears,  
1 gin rope, 2 patent steam pumps, 1 hoisting crab and rope, 4 wheelbarrows, 6 picks,  
36 pick shafts, 2 shovels, 4 saws, 1 axe, 2 hammers, 18 hammer shafts, 4 large  
water casks, 8 mine buckets, 4 barrels, 2 pair of standards, 2 tumbletrucks, 2 augers,  
2 tumbletrucks, 3 fire pans, 500 yards of water troughing, and about 3000 feet  
of larch pit wood.  
The Mine has been thoroughly proved, and a steady output may, it is believed,  
be relied upon.  
For conditions of sale, and further particulars, apply to ALAN B. SALMON, Soli-  
citor, Ulverston, and Barrow-in-Furness.

**PENPOL SMELTING WORKS.**  
POINT, NEAR TRURO, CORNWALL.  
TO BE SOLD, OR LET,  
These valuable Smelting Works, with very commodious and convenient Premises,  
and all necessary Plant and Machinery, constructed on the most approved  
principles, and in full working order, and whereon a large Tin Smelting  
Business has been carried on for many years.  
THE ABOVE VERY VALUABLE PROPERTY TO BE  
DISPOSED OF, BY PRIVATE TENDER, OR LEASED, for such term,  
not exceeding 14 years, as may be agreed on.  
There is a full water supply, and the MACHINERY include an excellent 12 in.  
horizontal STEAM ENGINE with 6 ton BOILER, crushers, stamps, frames,  
moulds, furnaces, cranes, trucks, hatches, fire-brick, timber, several tons  
of iron, smith's tools, assayers' tools, and all the requisites of a tin smelting  
business.  
With very little alteration and expense the premises could be adapted for the  
working of the manure trade, or any other mercantile business, and for which  
they offer a splendid opportunity.  
The premises are situated between Truro and Falmouth, and are easily and at all  
times accessible to shipping, being situated on the Devon branch of the Truro  
Railway.  
To view, apply to Mr. LANGDON, on the premises; and to treat for the same,  
apply to Messrs. HODGE, HOCKIN, AND MARRACK, Solicitors, Truro,  
or to Mr. LANGDON, Auctioneer, Lemon street, Truro; or to  
Messrs. HODGE, HOCKIN, AND MARRACK, Solicitors, Truro,  
of whom all further information may be obtained.  
Dated Truro, the 25th day of July, 1876.

**SPELTER WORKS.**  
TO BE SOLD, THE LEASE AND PLANT OF THE UPPER WORKS,  
BAGLIT, PLINTHIRE, extending over about TWENTY-SEVEN  
ACRES OF LAND; also about FOUR and a QUARTER ACRES OF FREEHOLD  
LAND, and one undivided third part or interest in the DEE BANK WHARF, ad-  
joining the said freehold.  
The said freehold is at present sufficient for the production of 30 tons of spelter per week,  
and may easily be made to produce (the greater part of the land being left off for farming);  
and there are extensive buildings for storing blende, and heated rooms for making and  
refining spelter.  
The works are now in operation, and with a production of only about 11 tons of  
spelter per week considerable profit has been realized during the last two years.  
There are several collieries in operation in the immediate neighbourhood, and the  
works are within easy reach of the North Wales blende-producing mines, and is  
situated on a large colliery, the Dee Bank Wharf named above, and  
bounded on three sides by a large colliery, the Chester and Holyhead Railway,  
the River Dee respectively. It is traversed by the Chester and Holyhead Railway,  
and situated within a few hundred yards of the Baglitt Railway Station. The site  
is, therefore, an unusually favourable one for the erection of works.  
Apply to H. C. CARVER, Llandidloes, Montgomeryshire.

**NORTH WALES.**  
TO SLATE QUARRY PROPRIETORS, CAPITALISTS, AND OTHERS.  
FOR SALE BY PRIVATE TREATY, A VERY VALUABLE  
SLATE AND SLAB QUARRY, situated at BETTWS-Y-COED, NORTH  
WALES, and within one mile of the railway station.  
The quarry produces slates of the largest size; the slates are in great demand;  
the machinery is unequalled in Wales; and the water power is ample.  
For further particulars, apply to Messrs. DAW and SON, Wellfield House, Bangor,  
and High-street, Rhyl.

**TALYBONT SILVER-LEAD MINING COMPANY**  
(LIMITED).  
FIVE HUNDRED SHARES TO BE SOLD, UNDER PAR.—  
A GENTLEMAN IN WANT OF A FEW HUNDRED POUNDS for im-  
mediate use is OPEN to RECEIVE AN OFFER. The shares are 20s. The pro-  
fits of the mine are excellent; see all the reports in the Mining Journal.  
Address, "Talybont," Messrs. Deacon's, Leadenhall street, London.

**TO PROMOTERS OF MINES.**  
ONE-FIFTH of a new SILVER-LEAD and COPPER SETT TO  
BE DISPOSED OF to any gentleman who will undertake to sell it, or  
TO FORM A COMPANY FOR WORKING THE SAME.  
For further particulars apply to "S." Post Office, Combmartin, near Barn-  
staple.

**COPPER MINE.**  
TO BE LET, FOR A TERM OF YEARS, A COPPER MINE.—  
For further particulars, address Mr. T. EVANS, Engineer, St. David's,  
Penbroskeshire.

**FOR SALE, TWO OF SHOLL'S DIRECT-ACTING PNEUMATIC**  
GOLD QUARTZ STAMMERS, made expressly for the Foreign Market.  
Can be seen at work at the Savile Street Foundry, Sheffield.  
Address, "Stamps," 65, Cranworth-street, Manchester.

**ON SALE, TWO CORNISH BOILERS, 30 ft. by 7 ft. diameter**  
Two flues through each. Safe at 60 lbs. pressure working.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE PAIR OF 18 in. high-pressure HORIZONTAL**  
ENGINES, for winding, fitted with slot link motion. First-class pair of  
engines.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE PAIR OF 15 in. HORIZONTAL WINDING**  
ENGINES, with slot link motion. Will be sold cheap.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE 25-horse power double cylinder PORTABLE**  
ENGINE, fitted with slot link motion for winding.  
ONE 20 horse power double cylinder PORTABLE ENGINE.  
Will be sold cheap, and are in first-class order.  
Apply to HENRY PARKINSON, Foundry-street, Bolton, Lancashire.

**ON SALE, ONE 8-horse power PORTABLE ENGINE, fitted**  
with winding drum; slot link motion; made by Clayton and Shuttle-  
worth. Price £110.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE PAIR OF 25 inch. coupled HORIZONTAL**  
WINDING ENGINES, with drums and brake gear. Also ONE PAIR of  
20 in. ditto. Will be sold cheap.  
Apply to H. PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE strong well-built condensing BEAM ENGINE,**  
by a first class maker, equal to new; cylinder 36 in. bore, 5 ft. stroke. Can  
be seen standing, and will be sold cheap. ONE close-built self-contained con-  
densing BEAM ENGINE, stands on independent bed on six columns; cylinder  
24 in. bore, 4 ft. stroke. As good as new. Can be seen standing, and will be sold  
cheap.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**BOILERS ON SALE.—FOUR GALLOWAYS PATENT**  
BOILERS, 30 ft. by 7 ft., safe to work at 70 lbs. on the square inch.  
TWO BOILERS, 24 ft. by 7 ft., with two flues through.  
ONE BOILER, 20 ft. by 7 ft., two flues through.  
ONE BOILER, 18 ft. by 6 ft., one flue through.  
Also several smaller sizes.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE 16 horse power double cylinder PORTABLE**  
ENGINE, for winding.  
ONE 12 horse power PORTABLE ENGINE.  
ONE 8 horse power PORTABLE ENGINE.  
ONE 6 horse power PORTABLE ENGINE.  
Equal to new, and will be sold cheap.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**ON SALE, ONE PAIR OF 25 in. horizontal WINDING ENGINES.**  
ONE PAIR of 18 in. horizontal WINDING ENGINES.  
ONE PAIR of 16 in. horizontal WINDING ENGINES.  
ONE PAIR of 15 in. horizontal WINDING ENGINES.  
ONE PAIR of 10 in. horizontal WINDING ENGINES.  
ONE PAIR of 7 in. horizontal WINDING ENGINES.  
The above engines are now ready for delivery, and fitted with winding drum  
and brake gear to each pair of engines.  
Apply to HENRY PARKINSON, Foundry-street, Bolton.

**FOR SALE, BY PRIVATE BARGAIN, A DIRECT-ACTING**  
or BULL-DOG BLOW-THROUGH CONDENSING PUMPING EN-  
GINE; diameter of cylinder, 48 1/2 inches; stroke, 12 feet, with GEARING,  
&c., at No. 2, TORBANE BOGHHEAD COLLIERY, BATHGATE.  
The engine can be seen at the pit.  
For price, apply to JAMES RUSSEL and SON, Falkirk, N.B.

**FOR SALE, A 18-horse power PORTABLE STEAM ENGINE,**  
with link motion reversing gear, ready for delivery.  
A 25-horse power PORTABLE STEAM ENGINE.  
An 18-horse power VERTICAL STEAM ENGINE, with link motion reversing  
gear, also gear to wind and pump.  
A 9 ft. PAN MORTAR MILL, VERTICAL ENGINE, and BOILER.  
Apply to—  
BARROWS AND STEWART, ENGINEERS, BANBURY.

**SULPHATE OF BARYTES FOR SALE.**—  
Fine powdered, beautifully white; also in the Rock or Crude State, free  
samples on application to—  
RUTHWAITE BARYTES MINING COMPANY,  
Nor. 17, 1876.  
WHITEHAVEN.

In the Court of the Vice-Warden of the Stannaries.  
Stannaries of Devon.  
IN the MATTER of the COMPANIES ACTS, 1862 and 1867, and  
in the MATTER of the GIRT AND HOLSTON DOWNS MINING  
COMPANY (LIMITED).—The Vice-Warden has, by an Order made in the above  
Matter, bearing date the 15th day of July instant, APPOINTED JOHN HENRY  
HAMLEY, of Truro, within the said stannaries, an Officer of the said Court, to  
be absolutely the OFFICIAL LIQUIDATOR of the ABOVE-NAMED COM-  
PANY.  
Dated Registrar's Office, Truro, 21st July, 1876.

In the Court of the Vice-Warden of the Stannaries.  
Stannaries of Devon.  
IN the MATTER of the COMPANIES ACTS, 1862 and 1867, and  
in the MATTER of the GIRT AND HOLSTON DOWNS MINING  
COMPANY (LIMITED).—Notice is hereby given, that ALL CREDITORS of the  
ABOVE-NAMED COMPANY are required, on or before the 9th day of August  
next, to SEND IN their NAMES and ADDRESSES, and the AMOUNTS and  
PARTICULARS of their SEVERAL CLAIMS, to JOHN HENRY HAMLEY,  
the Official Liquidator of the said Companies Court Office, in  
Truro, within the said Stannaries.  
FREDERICK MARSHALL, Registrar.  
Dated Registrar's Office, Truro, 21st July, 1876.

In the Court of the Vice-Warden of the Stannaries.  
Stannaries of Cornwall.  
IN the MATTER of the COMPANIES ACT, 1862, and of the  
WEST GWENAP CONSOLS MINING COMPANY.—Notice is hereby  
given, that a PETITION for the WINDING UP of the above-named company  
by the Court was, on the 24th day of July instant, presented to the Vice-Warden  
of the Stannaries, by William Harvey, Henry Whitford, William West, William John  
Rawlings, William Husband, Francis Harvey, and Nicholas James West (carry-  
ing on business at Hayle, within the said Stannaries, as General Merchants, under  
the style or firm of "Harvey and Co."), shareholders, and claiming to be also  
creditors of the said company, and that the said petition is directed to be heard  
before the Vice-Warden, at the Prince's Hall, in Truro, within the said Stannaries,  
on Tuesday, the 8th day of August instant, at Eleven o'clock in the forenoon.  
Any contributory or creditor of the company may appear at the hearing and  
oppose the same, provided he has given at least two clear days' notice to the peti-  
tioners or their solicitors of his intention to do so, such notice to be forthwith for-  
warded to P. P. Smith, Esq., Secretary of the Vice-Warden, Truro.  
Every such contributory or creditor is entitled to a copy of the petition and affi-  
davit verifying the same from the petitioners or their solicitors, within 24 hours  
after requiring the same, on payment of the regulated charge per folio.  
Affidavits intended to be used at the hearing, in opposition to the petition, must  
be filed at the Registrar's Office, Truro, on or before the 5th day of August next,  
and notice thereof must at the same time be given to the petitioners or their soli-  
citors.  
HODGE, HOCKIN, AND MARRACK, Truro, Cornwall.  
(Petitioners' Solicitors).  
Dated Truro, July 26, 1876.

In the Court of the Vice-Warden of the Stannaries.  
Stannaries of Cornwall.  
IN the MATTER of the COMPANIES ACT, 1862, and of the  
NORTH WHEEL CROFTY MINING COMPANY.—TENDERS will be  
RECEIVED by the Official Liquidator of the said company, at the Stannaries  
Court Office, in Truro, in the county of Cornwall, on or before the 9th day of  
August next, stating the HIGHEST PRICE which will be given for the 30 in.  
cylinder PUMPING ENGINE, 9 ft. stroke in cylinder, and 7 ft. 9 in. in shaft,  
with FIVE 10 ton BOILERS attached; and the 24 in. WINDING ENGINE, with  
fly-wheel, ONE 8 ton BOILER and large WINDING CAGE attached, now being  
in and upon the North Wheel Croft Mine, in the parish of Illogan, within the  
said Stannaries, and belonging to the said company.  
To inspect the above, apply to Capt. JOHN IVEY, of Tuckmill, within the said  
Stannaries; and, for further particulars, to Mr. JOHN HENRY HAMLEY, the Official  
Liquidator of the said company, at the Stannaries Court Office, Truro.  
HODGE, HOCKIN, AND MARRACK, Truro.  
(Agents for Tufnell Southgate, 7, King's Bench Walk, London,  
Solicitors for the Official Liquidators).  
Dated Stannaries Court Office, Truro, July 26th, 1876.

In the Court of the Vice-Warden of the Stannaries.  
Stannaries of Cornwall.  
IN the MATTER of the COMPANIES ACT, 1862, and of the  
NORTH ROSEWARNE MINING COMPANY.—TENDERS will be RE-  
CEIVED by the Official Liquidator of the said company, at the Stannaries Court  
Office, in Truro, in the county of Cornwall, on or before the 9th day of August  
next, stating the HIGHEST PRICE which will be given for the 30 in. PUMPING  
ENGINE and BOILER, now being in and upon the North Rosewarne Mine, in the  
parish of Gwinear, within the said Stannaries, and belonging to the said com-  
pany.  
To inspect the above, apply to Mr. WILLIAM HUTHWAXE, of Rosewarne, Gwinear  
vicarage; and for further particulars to Mr. JOHN HENRY HAMLEY, the Official  
Liquidator of the said company, at the Stannaries Court Office, Truro.  
HODGE, HOCKIN, AND MARRACK, Truro.  
(Solicitors for the Official Liquidator).  
Dated Stannaries Court Office, Truro, July 26th, 1876.

**PENANCE, AUGUST 3RD.**  
MINE SHARES FOR SALE.  
MR. W. HOSKEN RICHARDS (Auctioneer) WILL SELL, BY  
AUCTION, on Thursday, the 3rd August, 1876, at Four o'clock in the  
afternoon, at the Western Hotel, Penance,  
TWO (200ths) SHARES in the  
FAR-FAMED BOTALLACK MINE,  
ST. JUST, CORNWALL.  
Further particulars of the Auctioneer, 54 and 55, Causeway Head, Penance.  
Dated 22nd July, 1876.

**IPPLEPEN, SOUTH DEVON.**  
TO MARBLE MERCHANTS, LIME MERCHANTS, AND OTHERS.  
MESSRS. RENDELL AND SYMONS have been instructed to  
OFFER FOR SALE, at the Union Hotel, Newton Abbot, on Friday, the  
11th day of August, 1876, at Three for Four o'clock in the afternoon, all those  
DESIRABLE FREEHOLD QUARRIES,  
Situate adjoining the South Devon Railway, at Wrigwell, or Wigwell, in the parish  
of Ipplepen, together with the comfortable and well-built DWELLING HOUSE  
and ARABLE FIELD adjoining, known as NARROW PARK, and containing  
altogether 1A. 2R. 12P., be the same more or less, and being the closes or portions of  
the closes numbered 888, 889, 890, and 894 in the Title Map for the said parish of  
Ipplepen.  
The property is in the most desirable situation, having a siding from the railway,  
by which large quantities of Devonshire marble have been sent, and it is still be-  
lieved there is still a valuable vein which can be easily mined.  
There is a great demand for the stone, which is used for building at Plymouth,  
Dartmouth, Buxton, and intermediate places.  
There is a large lime kiln and appliances for loading any quantity of marble,  
lime, or stone.  
A purchaser not wishing to work the quarries, can be sure of obtaining a return  
of £4 per cent. on the amount of his purchase money.  
Adjoining the property offered for sale are another 11 acres, having the same  
run of rock, and which can be procured.  
A portion of the purchase money may, if required, remain on security of the  
property.  
Application to view should be made to Mr. J. B. FARLEY, on the Premises; and  
further particulars may be obtained from the Auctioneer, at Newton Abbot and  
Totnes; or from Messrs. HOOPER and MICHELMORE, Solicitors, Newton Abbot.  
Dated July 21st, 1876.

**TO MARINE ENGINEERS, IRONFOUNDERS, & OTHERS.**  
PRELIMINARY ANNOUNCEMENT—LIMEHOUSE.  
MR. RYMILL is favoured with instructions from Messrs.  
J. and A. BLYTH to SELL, BY AUCTION, at Fore-street, Limehouse,  
London, on Monday, September 11, and following days (owing to the freehold  
premises and houses adjoining being required for other purposes, and having pur-  
chased the extensive works lately occupied by Messrs. Dugden), the VALUABLE  
MACHINERY, comprising large Surfacing Lathes, Centre Lathes, Radial Drilling  
Machines, Shaping Machines (by Whitworth and Halse), Planing Machines, Slot-  
ting Machines, Screw-cutting Lathes, a 30 horse power condensing Beam Engine,  
Cornish Boilers, Pumping Engine, set of large Plate-bending Rolls, Pumping and  
Shearing Machine (by Cameron), Cook's Patent Steam Riveter (by Harvey),  
Punching and Shearing Machines, large Foundry Cupolas, Foundry Cranes, Steam  
Hammers (by Nasmyth and Hulse), Cranes, Circular Saw, several small Lathes,  
and an immense quantity of expensive Tools, 100 tons of new Iron, Steel, Brass,  
Copper, &c. Further particulars will be duly published.  
Royal Repository, Barbican, London, E.C.

**LEAD MINE NEAR CARSPHAIN, STEWARTY OF**  
KIRKCOUBRIGHT.  
TO BE LET, with immediate entry, and for such number of years  
as may be agreed upon, the  
WOODHEAD LEAD MINE,  
On the Craigellian Estate, situated in the parish of Carsphairn and Stewarty  
of Kirkcubright.  
This mine was opened in 1838, has been wrought ever since, and has yielded a  
large quantity of lead of the finest quality. The plant, machinery, &c., can be had  
at a valuation.  
JAMES MC CALL, at the Mine, will show the underground workings, as also the  
plans and sections; and for further particulars application may be made to A. ANDER  
MC GURRIE, Solicitor, Ayr; or to Mr. THOS. SMITH, Land Steward, North-  
Mains, Dumfries, Ayrshire.  
Ayr, June, 1876.

**MINES SOUTH-WEST OF IRELAND.**  
VALUABLE MINES OF SILVER-LEAD, ARSENICAL  
PYRITES, COPPER, and IRON, two miles long on the run of the lodes.  
TO BE LEASED, on highly favourable terms.  
Capitalists only may apply to "T. W.," MINING JOURNAL Office, 26, Fleet-street,  
London, E.C.

**BERCUNES MINE, NEAR LINDAL-IN-FURNESS.**  
TO BE SOLD, BY PRIVATE TREATY, all that VALUABLE  
HEMATITE IRON ORE MINE, situated at LINDAL-IN-FURNESS, and  
known by the name of—  
“BERCUNES.”  
As the same was recently worked by WORDSWORTH HARRISON, Esq., J.P., together  
with the ore at bank, about 100 tons, and the following MINING PLANT:—  
ONE STEAM BOILER with fittings, 800 feet of steam piping, 2 winding gears,  
1 gin rope, 2 patent steam pumps, 1 hoisting crab and rope, 4 wheelbarrows, 6 picks,  
36 pick shafts, 2 shovels, 4 saws, 1 axe, 2 hammers, 18 hammer shafts, 4 large  
water casks, 8 mine buckets, 4 barrels, 2 pair of standards, 2 tumbletrucks, 2 augers,  
2 tumbletrucks, 3 fire pans, 500 yards of water troughing, and about 3000 feet  
of larch pit wood.  
The Mine has been thoroughly proved, and a steady output may, it is believed,  
be relied upon.  
For conditions of sale, and further particulars, apply to ALAN B. SALMON, Soli-  
citor, Ulverston, and Barrow-in-Furness.

**CARDIGANSHIRE.**  
**NEW LISBURN MINE.**  
TO BE SOLD, BY PRIVATE CONTRACT, by the Executrix of  
the late GEORGE PELL, Esq., deceased, a FREEHOLD ESTATE, with the  
MACHINERY and MATERIALS now in use thereon, comprising the above Mine,  
together with the MINING LEASES of adjoining properties, as a going concern.  
It is believed the lodes of the Mine are a continuation of the well known Logylas.  
For plans and particulars apply to WALTER EDDY, Esq., Llangollen; and to  
view, Capt. BALL, on the Mine.

**TO CAPITALISTS OR PROMOTERS DESIRING TO**  
MAKE MONEY.  
TO BE SOLD, A COLLIERY ROYALTY IN NORTH WALES,  
close to rail or shipping port; several shafts partially sunk; coal fully proved  
of FOUR SEAMS of good HOUSE and STEAM COALS, in an area of upwards of  
400 acres of surface. It adjoins the West Mostyn Coal Field, just successfully  
launched, where under seams (including Cannel) have been proved in addition to  
the above; so that eminent engineers state that the available coal in this royalty  
may be 85 feet thick.  
Present holder will arrange to sell the entire to an individual or company for  
what it has cost him, dividing all profit made above, which, even in a normal state  
of the coal trade, must be large. Certain and safe surveys by eminent Stafford-  
shire and Welsh engineers have already been made.  
Address, Mr. WATSON, 27, Hamilton square, Birkenhead.

**A PROMISING LEAD MINE FOR SALE.**  
THE SOUTH WARD MINE, situated near Calstock, on the  
River Tamar, with a 22-in. PUMPING and DRAWING ENGINE,  
90 tons of PITWORK, CRUSHER, and all other appliances, is now OFFERED  
FOR SALE.  
All particulars will be given on application to "The Secretary," St. Andrew's  
House, 28, Cornhill, London.

**TAMAR VALLEY SILVER LEAD MINE, DEVON.**  
TO BE SOLD, BY PRIVATE TREATY, by the executrix of the  
late GEORGE PELL, Esq., deceased, all that desirable MINING SETT,  
situate in the parish of BEREDEVILLE, in the county of DEVON, together with the  
MACHINERY and MATERIALS now in use on the said mine, which will be  
offered FOR SALE as a GOING CONCERN.  
For plans and particulars, apply to WALTER EDDY, Esq., Llangollen; and to  
view, to Capt. TRUMAN, on the Mine.

**TO LEAD MANUFACTURERS, LEAD MERCHANTS,**  
CAPITALISTS, AND OTHERS.  
A RARE OPPORTUNITY now occurs for the PURCHASE of the  
LEASE and MACHINERY of large and well-known LEAD WORKS near  
LONDON. The works have been in active operation for many years past, and the  
machinery, which is in good going order, is capable of manufacturing from 100 to  
tons of sheet lead and pipe weekly.  
To capitalists this is recommended as an investment. Principals or their soli-  
citors only treated with.  
Further particulars may be had on application to Messrs. FENNER, HILTON, and  
GIFFORD, Accountants, of 2, Gresham Buildings, Guildhall, London, and of 12,  
Bond-street, Brighton; and of Messrs. BLANCHARD, RICHES, KILSBY, and WOOD,  
Solicitors, of No. 21, College Hill, Cannon-street, London, E.C.

**GLASGOW AND THE HIGHLANDS.**  
ROYAL ROUTE, VIA CRINAN AND CALEDONIAN CANALS.  
By Royal Mail Steamer, IONA, from GLASGOW, daily at Seven A.M., and  
from GREENOCK at Nine A.M., conveying passengers for the NORTH and WEST  
HIGHLANDS.  
See Bill, with Map and Tourist Fares, free, at Messrs. CHATTO and WINDUS,  
Publishers, 74, Piccadilly, London; or by post from DAVID HUTCHESON and Co.,  
119, Hope-street, Glasgow.

**THE BIRMINGHAM WAGON COMPANY (LIMITED)**  
MANUFACTURE RAILWAY WAGONS OF EVERY DESCRIPTION, for  
HIRE or SALE, on immediate or deferred payments. They have also wagons  
or hire capable of carrying 6, 8, and 10 tons, part of which are constructed spe-  
cially for shipping purposes. Wagons in working order maintained by contract.  
EDMUND FOWLER, Managing Director.  
WAGON WORKS, SMETHWICK, BIRMINGHAM.  
\*.\* Loans received on Debenture; particulars on application.

**MR. W. F. STANLEY, MATHEMATICAL INSTRUMENT**  
MANUFACTURER TO H.M.'S GOVERNMENT, COUNCIL OF INDIA,  
SCIENCE AND ART DEPARTMENT, ADMIRALTY, &c.  
MATHEMATICAL, DRAWING, and SURVEYING INSTRUMENTS of every  
description, of the highest quality and finish, at the most moderate prices.  
Price-list post free.  
ENGINE DIVIDER TO THE TRADE.  
ADDRESS—GREAT TURNSTILE, HOLBORN, LONDON, W.C.

**2, WEST STREET, FINSBURY CIRCUS.**  
(Facing Moorgate-street Station.)  
MR. W. WHITE begs to announce the REMOVAL of his  
LABORATORY, ASSAY OFFICE, and SCHOOL OF ASSAYING to the  
ABOVE ADDRESS.  
VACANCIES for TWO PUPILS, who, besides practical lessons, will have the  
use of an extensive Library, and a large collection of Minerals in aid of their  
studies. Terms on application.

**MESSRS. TREDINNICK AND CO., 79, CORNHILL, LONDON,**  
E.C., DEALERS IN STOCKS, DEBENTURES, AND SHARES.  
SHARES WANTED, at full market prices, less 1 1/2 per cent.:—Van, East Van,  
Glyn, Penstruthal, Great Laxey, Pateley Bridge, Roman Gravel, Tankerville, and  
Tinfroft; or shares in the London and Westminster, Union of London, London  
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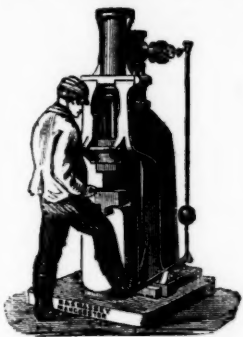
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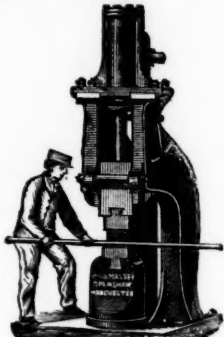
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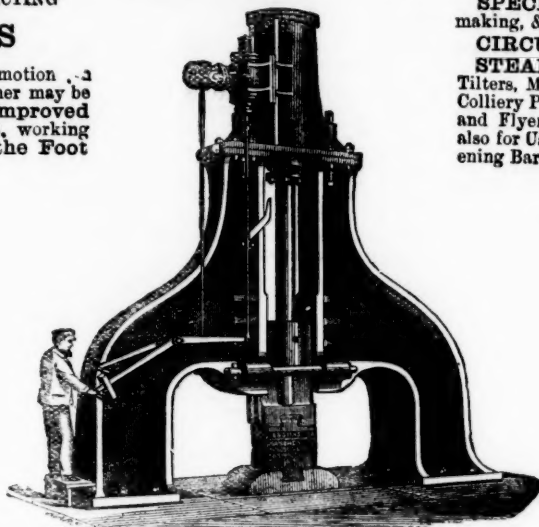
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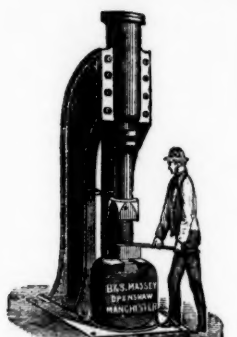
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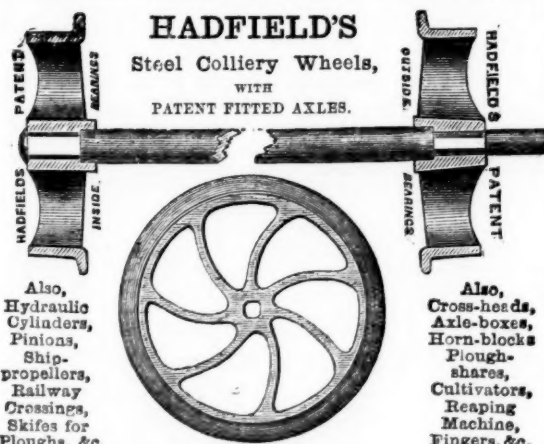
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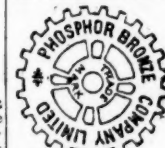
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"An interesting pamphlet, with carefully drawn maps, of the lead mining districts of England and Wales: . . . but apart from its especial value in that direction, the work is useful. . . . The pamphlet must be of the greatest value as affording plain and reliable data to guide them (those interested in this industry) in their speculations."—*Preston Guardian*.

"Valuable and interesting information is given relating to British lead mines."—*Portsmouth Times*.

"The pamphlet, which contains several excellent maps, should be in the hands of every mining investor."—*Cheltenham Express*.

"Mr. Murchison is an authority on the subject of the value and productiveness of our British Lead Mines, he having made that department of metallurgy his special study. His opinion, therefore, deserves the careful consideration of intending investors in this class of mines. Mr. Murchison, we see, brings forward a very considerable array of facts and figures to support his opinion, which is strongly in favour of British lead mines as an investment for British capital. It would certainly be better for English savings to be spent in developing English industry rather than to be sent (as they often are) abroad, to be lost in dangerous foreign speculations."—*Southampton Observer*.

"This work deserves the attentive perusal of those that have money to invest, and who may be thinking of purchasing shares in that particular branch of mining treated of in the work before us. . . . A large amount of information is undoubtedly given in these pages, which has the greatest possible interest for investors generally."—*Hampshire Advertiser*.

The book will be found well worth reading."—*Glasgow Herald*.



## THE MINING SHARE LIST.

## BRITISH DIVIDEND MINES.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
1000 Alderley Edge, c. Cheshire	10 00	—	—	—	12 11 8	0 5 0	Jan. 1876
18000 Balmynheer, c. Wexford (4000 to 18)	1 00	—	—	—	0 2 0	0 2 0	Nov. 1875
3000 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
4000 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875
3500 Barmby, c. A. Devon	116 50	—	—	—	619 18 0	0 5 0	Aug. 1875

## FOREIGN DIVIDEND MINES.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
35000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876
50000 Alamos, c. Spain	2 00	—	—	—	1 14 9	0 2 6	Mar. 1876

## NON-DIVIDEND FOREIGN MINES.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
20000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—
50000 Anglo-Australian, c. Victoria	2 00	—	—	—	2 10 0	—	—

## FOREIGN AND MISCELLANEOUS STOCKS, BONDS, LOANS, AND TRUSTS.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
Argentine, 1865, 6 per cent.	40 43	—	—	—	—	—	—
Bolivia, 6 per cent.	17 19	—	—	—	—	—	—
Brazil, 1865, 5 per cent.	92 94	—	—	—	—	—	—
Chilian, 1865, 7 per cent.	95 102	—	—	—	—	—	—
City of Providence, 5 p.c. coupon bonds	95 97	—	—	—	—	—	—
Egyptian, 1862, 7 per cent.	39 41	—	—	—	—	—	—
Do., 1865, 7 per cent.	39 41	—	—	—	—	—	—
Do., 2 per cent. V.M.L.	39 41	—	—	—	—	—	—
Do., 2 per cent. V.M.L.	39 41	—	—	—	—	—	—
Do., 2 per cent. V.M.L.	39 41	—	—	—	—	—	—

## NON-DIVIDEND MINES.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
40000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—
10000 Abernethy, c. Llandudno	1 00	—	—	—	1 0 0	—	—

## IRON AND COAL COMPANIES.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
41000 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—
15 Abbot, John, and Co. (L.)	275 00	—	—	—	—	—	—

## WAGON COMPANIES.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—
10 Birmingham Wagon Co. (L.)	10 00	—	—	—	—	—	—

## MISCELLANEOUS.

Shares.	Miners.	Divid.	Last wk.	Close Pr.	Total divs.	Per share.	Last week.
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—
100 Atlantic and Great Western Leased	100 00	—	—	—	—	—	—

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